DOE/EH-0396P

Chemical Safety Vulnerability Working Group Report

Volume 2 of 3
September 1994

U. S. Department of Energy

CONTENTS

VOLUME 1

VOLUME 2

VOLUME 3

APPENDIX A

TASKING
MEMORANDUMS

The Secretary of Energy

Washington, DC 20585

February 14, 1994

MEMORANDUM FOR TARA O'TOOLE, M. D., M.P.H.
ASSISTANT SECRETARY FOR ENVIRONMENT, SAFETY AND HEALTH

FROM: HAZEL R OLEARY

SUBJECT: VULNERABILITY REVIEW OF CHEMICAL SAFETY AT DEPARTMENT OF ENERGY FACILITIES

Recent events have emphasized the need for a thorough assessment of the chemical safety vulnerabilities associated with Department of Energy facilities that are in transition, or are awaiting decontamination and decommissioning. These events include the chemical explosion that occurred at the Tomsk nuclear processing plant in Russia, as well as operational mishaps resulting in chemical exposures at Department of Energy facilities. This assessment will provide valuable baseline information for important policy' issues that are being addressed by the Department.

The Office of Environment, Safety and Health will lead the assessment, with full participation of Department of Energy line programs with operational responsibilities. This assessment will identify, characterize, and assess the environment, safety, and health vulnerabilities associated with hazardous chemicals at Department of Energy facilities. It will examine existing conditions, activities, and approaches at the Department's facilities. This review will give particular attention to evaluating inactive facilities targeted for or currently undergoing decontamination and decommissioning.

This assessment is to be designed to be closely coordinated with and benefit from the ongoing Surplus Facility Inventory and Assessment Project being conducted by the Office of Environmental Restoration and Waste Management.

By March 18, 1994, the Office of Environment, Safety and Health should provide a project plan that outlines needed support and proposed schedules to all affected Headquarters and field elements. Field activities at most facilities should be initiated as quickly as possible thereafter. The Assistant Secretary for Environment, Safety and Health will submit a final report to me by July 29, 1994.

In conjunction with this assessment, the Office of Defense Programs will continue and expand its ongoing review to additional facilities which may have operations involving organic-nitrate reactions, which were implicated in the Tomsk explosion. This review is to be completed by July 29, 1994.

Department of Energy
Washington, DC 20585

February 10, 1994

MEMORANDUM FOR ALL DEPARTMENTAL ELEMENTS

FROM : TARA O'TOOLE, M. D., M.P.H. Tara O'Toole
ASSISTANT SECRETARY
ENVIRONMENT , SAFETY AND HEALTH

SUBJECT : VULNERABILITY REVIEW OF CHEMICAL SAFETY

The Secretary of Energy has directed the Office of Environment, Safety and Health to initiate a thorough assessment of chemical safety vulnerabilities associated with Department of Energy facilities, particularly those that have been in extended shutdown, are in transition, or are awaiting decontamination and decommissioning. Chemical safety hazards at those inactive facilities are least understood and are becoming increasingly important as the Department's mission continues to shift to cleanup and decontamination and decommissioning. A final report on the results of this vulnerability assessment is due to the Secretary on July 29, 1994.

The Office of Environment, Safety and Health has been designated as the focal point for the chemical safety vulnerability initiative. In order to ensure completeness and validity of the results, program offices, operations offices, and management and operating contractors will be fully involved in the assessment process. As with the recent Spent Fuel Initiative, that involvement will also be invaluable in establishing priorities and planning actions in response to the results.

For that reason, I am establishing the Chemical Safety Vulnerability Working Group, which will represent all departmental elements. The working group will be chaired by Michael Kilpatrick of the Office of Environment (EH-20). Each program and operations office should appoint a senior representative to the working group. The operations offices should facilitate participation by management and operating contractors and by laboratory management. (Information about an initial meeting of the working group is attached.)

This cooperative effort is in keeping with the Secretary's policy of providing a total quality management approach to departmental activities and is intended to accomplish the following specific goals:

- Identify any existing situations involving hazardous chemicals that need to be addressed to protect the environment, or public or worker health.

- Enhance the existing inventory of the types and locations of chemicals that are of concern to worker health and safety, especially at inactive facilities.

- Identify and prioritize vulnerabilities related to future decontamination and decommissioning activities at inactive facilities.

- As vulnerabilities are identified, a management action plan for eliminating or addressing such vulnerabilities will be developed.

To maximize the benefits of this effort, the chemical vulnerabilities review will parallel ongoing efforts through the Office of Defense Programs to evaluate the potential for organic-nitrate reactions (similar to the April 1993 explosion in Tomsk Russia) at Department of Energy facilities. The Secretary has directed the Office of Defense Programs to broaden that review and complete an evaluation of vulnerabilities at all Department f Energy facilities by July 29, 1994. The expanded review will be performed under the direction of Dr. Charles Gilbert (301-903-5012) by the same team of professionals assembled to evaluate the Tomsk explosion.

In addition, the chemical vulnerabilities initiative has been and will continue to be fully coordinated with the Office of Field Management. Every effort will be made by the Chemical Safety Vulnerability Working Group to minimize the impact of the group's activities on field operations. Field activities associated with this review will be initiated as soon as possible after completion of a project plan. However, the vulnerability assessment will be closely coordinated with data collection and validation activities being conducted by the Surplus Facility Inventory and Asessment Project, which is managed by the Office of Environmental Restoration and Waste Management, and vulnerability review activities at inactive facilities addressed by the Project will be sequenced to build upon the results of the Project in assessing vulnerabilities.

If you have any questions about this initiative, please do not hesitate to contact Michael Kilpatrick (202-586-4419) or Rebecca Hansen (301-903-5791), the Deputy Chairperson of the Working Group.

Attachment

cc: Laboratories
All Management and Operating Contractors

ATTACHMENT

INITIAL MEETING
OF THE
CHEHICAL SAFETY VULNERABILITY W0RKING GROUP

WHEN : March 1-2, 1994

WHO: A senior representative with background/expertise in chemical safety issues should be designated from:

- o Each DOE Program Office
- o Each DOE Operations Office, Site Office and Field Office
- o Each Laboratory and M&O Contractor

Working Group representatives will be actively involved in all phases of the Vulnerability Study through completion July 29, 1994.

Large sites are requested to provide two or more representatives. Operations offices are requested to facilitate full participation by Laboratories and M&O Contractors.

PURPOSE: To develop Project Plan and approach for Vulnerability Review of Chemical Safety.

WHERE : Gaithersburg Hilton
620 Perry Parkway
Gaithersburg, MD 20877
(301) 977-8900
Toll Free for Reservations: 1-800-599-5111
Rate: $85/daily, tax included

A block of rooms has been reserved at the Hilton for February 28-March 1, 1994. Each attendee must confirm his/her reservation before February 23, 1994. Please reference the Department of Energy Chemical Safety Workshop when making a reservation.

TENTATIVE AGENDA:

Discuss Scope, Approach, Schedule
Identify Applicable Chemical Safety Criteria
Develop Screening Criteria for Site Selection
Develop Question Set
Develop Project Plan
Discuss Review Output and Format

CONTACT: Please provide name, phone and fax numbers of representatives NOT LATER THAN FEBRUARY 18, 1994 to:

Mary Meadows 301-903-8805

Additional information on logistics and background will be provided to Working Group members at that time.

APPENDIX B

PROJECT PLAN
FOR THE
CHEMICAL SAFETY VULNERABILITY REVIEW

Issued: March 14, 1994

OFFICE OF ENVIRONMENT, SAFETY AND HEALTH

Project Plan
for the
Chemical Safety
Vulnerability Review

Prepared by:

Michael A. Kilpatrick
Co-Chairman

R.B. Hansen for

Oliver D.T. Lynch, Jr.
Co-Chairman

Reviewed by: Joseph E. Fitzgerald Jr.

Joseph E. Fitzgerald, Jr.
Deputy Assistant Secretary
Safety and Quality Assurance

Approved by: Tara O'Toole

Tara O'Toole, M. D., M.P.H.
Assistant Secretay
Environment, Safety and Health

CONTENTS

ATTACHMENTS

INTRODUCTION

Based on direction from the Secretary of Energy,' the Assistant Secretary for Environment, Safety and Health established the Chemical Safety Vulnerability Working Group to identify and characterize adverse conditions or circumstances involving potentially hazardous chemicals at facilities owned or operated by the U.S. Department of Energy (DOE).[2] This project plan describes the methodology and schedule developed by the Working Group to accomplish these goals.

Specifically, the Working Group is tasked with identifying chemical safety vulnerabilities associated with conditions or circumstances that might result in (1) fires or explosions from uncontrolled chemical reactions, (2) exposure of workers or the public to chemicals, or (3) releases of chemicals to the environment. The Working Group will evaluate a range of facilities (based on facility type and operational status), giving special attention to facilities being transferred to, awaiting, or undergoing decontamination and decommissioning (D&D). The review will identify conditions or circumstances related to chemical safety that have received little or no attention but that may become more important with time. Facilities with stable chemical processes or inventories that may be subject to degradation over time will also be analyzed for vulnerabilities.

The Working Group's final report will identify facility-specific and generic (i.e., complex-wide) vulnerabilities involving hazardous chemicals. The final report will also enhance the Department's knowledge about the types and locations of existing chemical inventories that are of potential concern to worker health and safety, especially at inactive facilities.

The information obtained as a result of this review will permit the identification and prioritization of vulnerabilities affecting chemical safety as DOE proceeds with D&D of inactive facilities. Consequently, DOE will be able to implement measures to minimize hazards confronting workers, the public, and the environment before cleanup begins. As chemical safety vulnerabilities are identified, a parallel activity will be initiated to develop a management response plan for addressing these vulnerabilities.

The Secretary directed the Office of Environment, Safety and Health (EH) to lead this review, with the full participation of DOE line programs with operational responsibilities. To ensure that a high level of collaboration is achieved across the DOE complex, EH developed the following methodology:

- A Working Group, including representatives from DOE line programs with operational responsibility, was convened to develop the project plan;

---

[1] Memorandum from Hazel R. O'Leary to Tara O'Toole, "Vulnerability Review of Chemical Safety at Department of Energy Facilities," dated February 14, 1994.

[2] Memorandum from Tara OToole to all Departmental Elements, "Vulnerability Review of Chemical Safety," dated February 10, 1994.

- Field personnel have been tasked with collecting data for analysis by the Working Group and with identifying lessons learned to be shared with other DOE elements;

- Field personnel will be actively involved in the data verification process;

- Working Group members representing DOE line programs with operational responsibilities will review the data collected to identify, characterize, and prioritize chemical safety vulnerabilities; and

- Working Group members representing DOE line programs with operational responsibilities will participate in developing the management response plan.

BACKGROUND

As the United States enters the post-Cold War era, the mission of the Department is undergoing a dramatic shift: the nuclear weapons complex is being sharply downsized, and DOE is redirecting its emphasis to environmental cleanup and to the development of new energy technologies. As a result, many DOE facilities that once used significant quantities of hazardous chemicals as part of the nuclear weapons production process have been shut down and are awaiting D&D. In some cases, hazardous chemicals and chemical wastes associated with these facilities remain in place-a situation that creates the potential for current and future vulnerabilities affecting the environment, the public, and worker safety and health.

To establish priorities for transition efforts at facilities awaiting D&D, the Office of Environmental Restoration and Waste Management (EM) is conducting the Surplus Facility inventory and Assessment Project. This effort will identify (1) facilities awaiting transition to D&D and (2) chemical and radiological inventories associated with these facilities. Additional action is required, however, to identify generic and facility-specific vulnerabilities associated with chemicals and chemical wastes not covered by this project and to ensure that actions to minimize hazards are in place before cleanup activities begin (which, in some cases, may be years away).

Many DOE facilities built during World War II or shortly thereafter contain few of the safety systems that are now required. World War II era buildings were built for multiple purposes, and their designs included some flexibility to accommodate future modifications. Over the years, this practice has resulted in numerous facility modifications and mission changes. Because of past weaknesses related to older safety systems and the lack of effective configuration management, the Department's leaders are concerned that there may be chemical safety vulnerabilities associated with these aging facilities. As older facilities reach the end of their design life and await D&D, or yet another modification, the potential for degradation of systems through the action of unknown or unspecified chemicals is heightened. Moreover, many operating facilities using hazardous chemicals may be subject to significant vulnerabilities that have not yet been addressed.

Although aggressive chemical safety programs are not new, the Department is concerned that, historically, chemical safety for operating facilities has not received the same foresight, attention, and rigor associated with nuclear safety, This concern has led to questions about the adequacy of (1) safety measures (procedural, administrative, or hardware) implemented over the design life of DOE facilities and (2) management's understanding of existing chemical safety vulnerabilities. The current review is based on the premise that these vulnerabilities must be identified and adequately addressed to ensure that the environment, the public, and worker safety and health are protected now and in the future.

To respond to these concerns, the Secretary of Energy tasked EH with leading a working group to evaluate "chemical safety vulnerabilities associated with Department of Energy facilities." This effort is to be completed by July 29, 1994, and should "have the full participation of Department of Energy line programs with operational responsibilities." The review should "identify, characterize, and assess the environment, safety, and health vulnerabilities associated with hazardous chemicals at Department of Energy facilities." In addition, the review should "give particular attention to evaluating inactive facilities targeted for or currently undergoing decontamination and decommissioning."

The Assistant Secretary for Environment, Safety and Health directed the Chemical Safety Vulnerability Working Group to coordinate closely with all affected departmental elements to ensure that the impact of the review on field operations is minimized. The Assistant Secretary established the following specific goals for the Working Group:

- "Identify any existing situations involving hazardous chemicals that need to be addressed to protect the environment, or public or worker health";

- "Enhance the existing inventory of the types and locations of chemicals that are of concern to worker health and safety, especially at inactive facilities";

- "Identify and prioritize vulnerabilities related to future decontamination and decommissioning activities at inactive facilities"; and

- "As vulnerabilities are identified, a management action plan for eliminating or addressing such vulnerabilities will be developed."

The Secretarial tasking will also require that the Office of Defense Programs (DP) broaden the scope of its review of organic-oxidizer vulnerabilities to include other facilities that may have operations involving organic-oxidizer reactions. The DP study was originally initiated as a response to a chemical explosion at the Tomsk-7 nuclear processing facility in Russia. (The explosion has been attributed to a runaway organic-nitrate chemical reaction.) The organic-oxidizer review is also scheduled for completion by July 29, 1994. In addition, the Secretary directed that the Chemical Safety Vulnerability Review be closely coordinated with the Surplus Facility Inventory and Assessment Project being conducted by the Office of Facility Transition and Management (EM-60),

The EH Chemical Safety Program, established in March 1992, has been the Department's principal mechanism for identifying chemical safety vulnerabilities. The primary objective of the initial activities of the program was to identify, through a limited sampling process, the existence of chemical hazards that posed imminent danger or threat to workers, co-located workers, the general public, or the environment. This initial effort resulted in DOE/EH-0282, "Task Group Report to the Assistant Secretary for Environment, Safety and Health on

Oversight of Chemical Safety at the Department of Energy," dated November 1992. No imminent danger situations were identified. Since that time, the EH Chemical Safety Program has participated in developing chemical safety training and guidance, as well as conducting a limited number of reviews. However, too little progress has been made in conducting reviews that will identify problems likely to confront the Department in the future.

The Chemical Safety Vulnerability Working Group will go beyond other efforts by considering end-of-life chemical safety issues affecting facilities that are no longer operational. The current review will include a larger and more diverse sampling of facilities to provide a better indication of the chemical safety vulnerabilities that confront a variety of DOE facilities. Working Group members will try to avoid duplication of past efforts, while seeking added insights into understanding issues related to chemical safety.

SCOPE

It is not possible to visit every DOE facility for the purposes of this review. Therefore, the Chemical Safety Vulnerability Working Group will focus its efforts to achieve the maximum results possible in the time available. Based on guidance provided by the Secretary of Energy and the Assistant Secretary for Environment, Safety and Health, the review will concentrate on identifying chemical safety vulnerabilities associated with facilities being transferred to, awaiting, or undergoing D&D. The review will attempt to identify conditions involving hazardous chemicals that need to be addressed in order to ensure the protection of the environment, the public, and worker health and safety. Operating facilities with stable chemical processes or inventories that may be subject to degradation over time will also be surveyed. This approach will accomplish the following:

- Identify chemical safety vulnerabilities associated with specific facilities;

- Use facility-specific vulnerabilities to identify generic chemical safety vulnerabilities with applicability to the entire DOE complex; and

- Improve the existing inventory relative to the types and locations of chemicals that affect worker safety and health.

In the established focus areas, the Chemical Safety Vulnerability Working Group has designated a number of facilities across the DOE complex for review. (See "Phase II - Field Self-Evaluation" below for an explanation of the selection process.) Field personnel have been asked to conduct self-evaluations at selected facilities using a preestablished question set, Based on these self-evaluations, several sites will be selected by the Working Group for field visits, during which the data provided by the field will be verified and chemical safety vulnerabilities will be further evaluated.

PROJECT APPROACH

The concept of a vulnerability review involves more than looking at risks. It involves looking at real hazards and how workers, the public, or the environment could be injured. The following principles will guide the Working Group's approach to this review:

- Emphasis will be placed on what can go wrong in the future, as well as what can go wrong now;
- Generic vulnerabilities with complex-wide implications will be characterized and prioritized to enable the Department to take actions that will eliminate or reduce potential consequences;
- Data collected and reported to the Working Group will include detailed background information that can be used to formulate policy for important departmental issues;
- Facility-specific chemical safety vulnerabilities will be sought and identified; and
- The review will not be conducted as a compliance review.

The Chemical Safety Vulnerability Working Group will approach the project in phases, as follows:

- <u>Phase I - Organization</u>, The project plan and all its elements were developed in cooperation with line managers from field and program organizations.
- <u>Phase II - Field Self-Evaluation</u>. Initial data related to chemical safety vulnerability will be collected from designated facilities across the DOE complex.
- <u>Phase III - Field Verification</u>. Field verification teams representing the Working Group will conduct facility visits at a limited number of sites to verify and expand data collected during Phase II.
- <u>Phase IV - Vulnerability Prioritization</u>. Identified vulnerabilities will be characterized and prioritized as facility-specific or generic vulnerabilities. The prioritization of vulnerabilities will be based on the immediacy and severity of their potential consequences.
- <u>Phase V - Management Response Plan Development</u>. The management response plan will address actions to be taken to eliminate or reduce the potential consequences associated with identified chemical safety vulnerabilities. Sites will develop plans for facility-specific vulnerabilities, and the Working Group will develop the plan to address generic vulnerabilities.
- <u>Phase VI - Report Preparation</u>. The final report will document the results of the Working Group's activities.

Since the Chemical Safety Vulnerability Working Group is coordinating its efforts with the EM Surplus Facility Inventory and Assessment Project, information provided by EM has been used to select transition facilities for review. Additional information that may be available through this mechanism includes the following:

- Information on hazardous chemical inventories;
- Status of equipment and facilities;
- Potential threats to worker safety; and
- Potential threats to the environment.

The DP Tomsk lessons-learned review of organic-oxidizer vulnerabilities is another important activity associated with the Secretary's direction to conduct a thorough evaluation of chemical safety vulnerabilities across the DOE complex. Scheduled for completion by July 29, 1994, the DP review originated as a response to an explosion at the Tomsk-7 nuclear processing facility in Russia, The Chemical Safety Vulnerability Working Group will coordinate with the DP organic-oxidizer review team relative to significant issues of mutual interest, and the two studies will coordinate their work in a manner that will minimize duplication.

Phase I - Organization

The Working Group consists of representatives of line management from field and program offices for both DOE and contractor organizations. A core group of EH personnel was assigned to the Working Group to organize and lead the effort. (A list of core group personnel is provided in Attachment 1.) Core group personnel developed a draft project plan and held a 2-day organizational meeting for the Working Group in Gaithersburg, Maryland, on March 1 –2, 1994. This project plan is a product of that meeting. (An attendance list and an agenda for the meeting are provided in Attachment 2.)

The Chemical Safety Vulnerability Working Group is required to submit a final report to the Secretary of Energy by July 29, 1994. Based on this deadline, a project schedule was developed that would fulfill all Working Group objectives. (The schedule is provided in Attachment 3.) This schedule does not make allowances for delays. Given the ambitious agenda and tight timetable of this review, it is imperative that all Working Group members meet the milestone dates specified in the project schedule.

The Co-Chairmen of the Chemical Safety Vulnerability Working Group will assign responsibility for coordinating efforts with the EM Surplus Facility Inventory and Assessment Project to a member of the core group. Cooperation of this kind will allow the Working Group to determine what specific data from the EM project will be available for the Working Group's use, how that information can be retrieved from the data base, and how the two groups can cooperate to minimize the impact of their activities on field operations.

The Co-Chairmen will also assign responsibility for coordinating with DP on the expanded organic-oxidizer review to a member of the core group. Because the DP study will be completed concurrently with the Working Group effort, the final report will not be able to incorporate all applicable aspects of the organic-oxidizer review. The Working Group report will, however, discuss broad issues associated with the organic-oxidizer review to provide an overall perspective of the chemical safety vulnerabilities confronting DOE. The core group member assigned to coordinate with the organic-oxidizer review team should establish a means for exchanging information and should ensure that the Working Group does not duplicate DP's efforts.

Phase II - Field Self-Evaluation

The field self-evaluation process is designed to obtain information about chemical safety vulnerabilities at a wide range of DOE facilities and to ensure participation from DOE line organizations. A total of **84** facilities at 29 DOE sites was selected to conduct self-evaluations. (The sites and facilities selected to participate in this activity are listed in Attachment 4.) Selection was based on the types of chemical hazards known to exist at given facilities and on the need to provide an appropriate cross-section of DOE sites. (The criteria used for selecting specific facilities are provided in Attachment 5.)

Local DOE line organizations will be responsible for timely and accurate completion of the field self-evaluations. Working Group members assigned to these organizations will brief senior management on the background, schedule, and requirements of the field self-evaluations. Local DOE line organizations will also be responsible for working with management and operations (M&O) contractors in preparing the management response plan and keeping the cognizant DOE operations office and program office informed.

During the self-evaluation phase, a series of four conference calls will be conducted to answer questions and to provide weekly updates on the status of the review. Each conference call can accommodate up to 60 participants. The first call was conducted on Tuesday, March 8, 1994, at 1:30 p.m. (Eastern time). (Subsequent calls will be conducted at the same time on March 15, March 22, and March 29, 1994. The need for additional conference calls will be reviewed as appropriate.)

Working Group members representing the sites (contractor and DOE field personnel) will provide assistance for organizing appropriate self-evaluation teams, disseminating information to the facilities, and collecting and transmitting self-evaluation results to the Working Group. The actual conduct of field self-evaluations should be accomplished by personnel at each facility who are knowledgeable about both the facility and the subject matter involved (e.g., chemical operations, chemical safety, chemical inventory, and damage or release mechanisms). In the **case** of inactive facilities with no **assigned personnel, local** DOE line management should coordinate with site M&O contractors to ensure that self-evaluations are performed by qualified personnel.

To permit the Working Group to analyze the data on **a** common basis and to identify potential chemical safety vulnerabilities at a large number of facilities, a standard set of questions was developed to guide the self-evaluation process. (The "Field Self-Evaluation Question Set" is provided in Attachment 6.) It is crucial for each designated facility to complete the question set as fully and accurately as possible.

DOE personnel assigned to coordinate this effort should have experience in chemical safety and should be able to analyze the data in a manner that will ensure consistency between facilities. The local DOE line organization should provide input and analysis to the contractor organization throughout the self-evaluation process, thereby ensuring that the data are accurate and complete. The resulting analysis and supporting data should be submitted directly to the Deputy Chairperson of the Chemical Safety Vulnerability Working Group, in care of the Operations Management Division (EH-321), by April 4, 1994. Each submission should include both a hard copy and an electronic version (preferably in WordPerfect 5.1) of the self-evaluation.

It must again be stressed that the Working Group's schedule is extremely tight and does not make allowances for the late submission of field self-evaluations. These data will have a direct bearing on the field verification phase of the review and will drive the selection of sites to be visited by verification teams representing the Working Group. Because the Working Group has an obligation to obtain accurate and complete data for each facility listed in Attachment 4, it is in the interest of each site to ensure that this information is submitted in a timely manner.

The local DOE line organization is responsible for ensuring that vulnerabilities identified during the self-evaluation process are addressed either by an existing action plan or by a new entry into an appropriate tracking system. Determination of actions to be taken, milestones, and closeout requirements are the responsibility of line management through existing mechanisms.

Phase III - Field Verification

The field verification process is designed to use independent teams of safety professionals to verify the accuracy and completeness of the data provided by. the field self-evaluations. The verification process also offers an opportunity to examine facility-specific chemical safety vulnerabilities and to make informed judgments about the seriousness of these conditions.

Nine sites participating in the field self-evaluations will be chosen for verification visits. The sites to be involved in the field verification process will be selected based on the core group's recommendation after review of completed field self-evaluation question sets. Site selection will be influenced by the need to obtain a balanced cross-section of DOE facilities, to conduct further investigation of selected facilities, and to verify questionable data or obtain missing data.

The Co-Chairmen of the Chemical Safety Vulnerability Working Group will assign team leaders to organize field verification visits, and teams will visit the nine selected sites during the dates specified in the schedule. Site visits are expected to last for 10 days, beginning on a Monday with inbriefings at the site and ending on a Wednesday with an outbriefing to site management.

The Co-Chairmen will assign a member of the core group to develop a guide for use by field verification teams during site visits. This guide will be developed while the field self-evaluations are being completed and will be provided to verification team members and to the sites selected for verification visits.

The field verification guide will describe team leader and team member responsibilities, team organization and staffing, report format, and lines of inquiry along five functional areas. The five functional areas for the lines of inquiry are as follows:

- Identification of chemical holdings, which will include the properties of chemicals located at the facility, the characterization of those chemicals, and an analysis of the inventory.

- Facilitv physical condition, which will include engineered barriers, maintenance conditions, chemical systems, safety systems, storage, monitoring systems, and hazards identification.

- Operational control and management svstems, which will include organizational structure; requirements identification; hazard analysis; procedural adherence; maintenance control; engineering and design reviews; configuration control; safe shutdown plans; and site programs for quality assurance, chemical safety, inventory control, access control, disposal, transportation and packaging, and corrective actions.

- Human resource programs, which will include technical competence, staffing, training and qualifications, employee involvement, employee concerns, personnel performance requirements, and visitor and subcontractor control.

- Emergency response program, which will include the emergency response plan, inplant consequences, environmental issues, coordination with the community, and community right-to-know issues.

During the verification process, all facilities included in the self-evaluations at a single site will be visited. Team members will interact with designated facility and site personnel to verify data and obtain needed information. These facility and site personnel will be asked to participate in factual accuracy reviews for identified chemical safety vulnerabilities. The team leader will meet with line management representatives on a daily basis to provide information about team activities.

Each team will characterize and prioritize the chemical safety vulnerabilities that are identified at each facility visited (see "Phase IV - Vulnerability Prioritization" below for an explanation of this process). The team will identify vulnerabilities that currently exist as well as the potential for vulnerabilities that may exist in the future. The team will also conduct an outbriefing with local DOE and M&O line management personnel at the conclusion of the site visit. At closeout, a list of prioritized facility-specific chemical safety vulnerabilities will be provided and any information needed to complete the evaluation will be identified. As with the field self-evaluation process, local DOE line organizations are responsible for ensuring that vulnerabilities identified during the field verification phase are addressed.

Phase IV - Vulnerability Prioritization

Vulnerability prioritization will be accomplished on both a facility-specific and a generic basis. Facility-specific prioritization will occur during field verification visits and will result in a list of facility-specific chemical safety vulnerabilities. Generic prioritization will occur after the field verification process and will result in a list of complex-wide chemical safety vulnerabilities.

Facility-specific vulnerabilities identified during field verifications will be prioritized in a manner that will facilitate the development and implementation of effective actions by local DOE line management to eliminate vulnerabilities or to reduce their potential consequences (see "Phase V - Management Response Plan Development" below for an explanation of this process). Prioritization will be based on informed judgments by safety professionals concerning the immediacy of the potential consequences posed by a vulnerability and on the potential severity of those consequences.

The criteria to be used for prioritizing facility-specific chemical safety vulnerabilities are provided in Attachment 7. The first step in the prioritization process will be to group vulnerabilities according to the timeframe in which they are expected to produce consequences. The next step will be to rank the priority of the vulnerabilities within each group according to the severity of their potential consequences.

After completion of the field self-evaluations and field verifications, the completed list of identified vulnerabilities will be analyzed by core group personnel for assignment to one of two areas:

- Facility-specific vulnerabilities, which are unique and have little or no relevance to other **DOE** facilities; and

- Generic vulnerabilities, which represent complex-wide problems.

To ensure that the list of vulnerabilities used in this analysis is complete, core group personnel will review the results of other departmental efforts in the area of chemical safety. These efforts include the DP organic-oxidizer review, the November 1992 study on chemical safety (see "Background" above), and recent reviews conducted through the EH Chemical Safety Program.

The prioritization of generic vulnerabilities will also use the criteria contained in Attachment 7. After the list of generic chemical safety vulnerabilities has been compiled, core group personnel will make an initial determination of the priority of generic vulnerabilities. The Working Group will review the results of this prioritization process and will recommend changes when it meets on June 7-8, 1994. The list of prioritized generic vulnerabilities will form the basis of the Working Group's final report and will provide a focus for developing the management response plan.

Phase V - Management Response Plan Development

To accompany the final report of the Chemical Safety Vulnerability Review, the Working Group will develop a management response plan to address actions that should be taken to eliminate or reduce the consequences associated with chemical safety vulnerabilities. Site organizations will be responsible for developing management response plans for identified facility-specific vulnerabilities. Vulnerabilities with "immediate" consequences should evoke prompt responses, whereas vulnerabilities with "long-term" consequences can be addressed over a longer period of time. Consequence severity should also be considered to determine the appropriate response time for a given vulnerability.

Local DOE line management will be responsible for responding to facility-specific chemical safety vulnerabilities identified during the field self-evaluations and field verifications and will track vulnerabilities using existing systems. Actions to eliminate or mitigate facility-specific vulnerabilities should be prioritized based on the immediacy and seventy of the consequence, and strategies for corrective action should consider existing budgetary constraints. The prioritized lists of vulnerabilities for the nine sites that will be visited by field verification teams are intended to facilitate this process, (Note that new management response plans for facility-specific vulnerabilities identified during previous efforts and for which action plans already exist need not be developed. Copies of applicable portions of existing action plans should be provided to the Working Group concurrently with management response plans developed to address newly identified facility-specific vulnerabilities.)

The approval process for management response plans developed to address facility-specific chemical safety vulnerabilities identified during facility self-evaluations or by the Working Group during verification visits should be handled through routine line management channels. Local DOE line management should forward copies of management response plans for facility-specific vulnerabilities to the Working Group (in care of EH–321) by June 1, 1994. This submission will provide information needed by the Working Group to identify, characterize, and prioritize chemical safety vulnerabilities that confront the complex as a whole. The submission will also ensure consistency between the overall management response plan and the management response plans developed to address facility-specific vulnerabilities. (As already noted, sites need not develop new management response plans for facility-specific vulnerabilities identified during previous efforts and for which action plans already exist.)

After the field verifications are complete and the core group produces a prioritized list of the generic chemical safety vulnerabilities confronting the DOE complex, the Working Group will meet to review the list and to formulate input for an overall management response plan. Participation in this meeting will provide line management with an opportunity to contribute to a Department-wide response to chemical safety vulnerabilities. A subgroup representing the Working Group will then be tasked to develop the management response plan.

The management response plan for generic vulnerabilities should have a medium- to long-term emphasis that addresses issues related to programs, funding, and policy decisions for the Department as a whole. Generic vulnerabilities with immediate or short-term consequences should be turned over to the responsible Cognizant Secretarial Officer(s) for immediate action on an as-appropriate basis. In these cases, the Working Group will provide a coordinating role and the management response plan will document the actions to be taken.

Phase VI - Report Preparation

The Chemical Safety Vulnerability Working Group will submit a final report to the Secretary of Energy by July 29, 1994. The Co-Chairmen of the Working Group will assign a core group member to develop the final report format during the field self-evaluation phase of this review. The main body of the report should be geared toward providing senior DOE management with basic information on generic and facility-specific chemical safety vulnerabilities, which in turn can be used to formulate policy for important issues being addressed by the Department. The final report will be a concise summary of the Working Group’s analyses and observations and will include a number of appendixes containing extensive background information and data from the field self-evaluations and field verifications.

PROTOCOL

EH will lead the Chemical Safety Vulnerability Working Group and provide a core group of personnel to participate in and support the Working Group. The EH core group will provide staff resources to facilitate the organization and execution of the review.

Local DOE line management organizations will be responsible for the field self-evaluations and will be the main points-of-contact for the field verifications. To promote the involvement of local DOE line management and to permit completion of the project within the time provided, communication between the Working Group and facilities selected for self-evaluation will be handled through local DOE organizations. DOE line management will submit field self-evaluation data directly to the Chemical Safety Vulnerability Working Group.

Field verification teams will work closely with local DOE line management during verification visits. Vulnerabilities identified by these teams will be discussed with management personnel, who in turn should initiate responses through existing local mechanisms. Copies of action plans should be forwarded to the Working Group. Field verification teams will conduct an outbriefing with local DOE and M&O line management personnel at the conclusion of each site visit: a list of prioritized chemical safety vulnerabilities will be provided, and any information needed to complete the evaluation will be identified. DOE line management should address any facility-specific vulnerabilities that are identified as a result of the field self-evaluation or field verification processes.

The Co-Chairmen of the Chemical Safety Vulnerability Working Group will assign a member of the core group to develop a communication plan identifying required concurrences for the final report and to determine distribution schedules. The final report will be signed by the Assistant Secretary for Environment, Safety and Health.

The management response plan for generic DOE chemical safety vulnerabilities will be developed at a Working Group meeting after completion of the field verifications. The plan will thus be based on input provided by DOE line management personnel representing both field and programmatic elements. The management response plan will be developed and routed concurrently with the final report.

Attachment 1

CORE GROUP PERSONNEL

Co-Chairmen	Michael A. Kilpatrick, EH–24 Oliver D.T. Lynch, Jr., EH-32
Deputy Chairperson	Rebecca F. Hansen, EH–321
EH Core Group	James G. Bisker, EH–313 Victor 1. Crawford, EH–24 Richard L. Dailey, EH–231 Robert W. Everson, EH–30.3 Brenda W. Holder, EH-41 Darrell A. Huff, EH–331 Sanjeeva M. Kanth, EH–312 Leonard M. Lojek, EH-321 Daniel J. MarSick, EH-312 Gerald E. Meyers, EH–313 Kenneth G. Murphy, EH-331 Bradley A. Peterson, EH-321 Richard J. Serbu, EH-331 Patricia R. Worthington, EH–12
Technical Experts	Del Bunch, Management Strategies, Inc. David Johnson, Program Management, Inc. Thomas Kevem, Program Management, Inc. John S. Stone, Kaiser Engineers Hanford Pamela Sutherland, Battelle Memorial Institute - Columbus Mike Yurconic, Pacific Northwest Laboratory
Chief Coordinator	Mary E. Meadows, Environmental Management Associates
Executive Assistant	Lisa Alexander, Program Management, Inc.
Technical Editor	Darla Treat Courlney, Environmental Management Associates
Policy Analyst	Donna J. Thompson, Program Management, Inc.

Attachment 2

WORKING GROUP MEETING, MARCH 1-2, 1994

Department of Energy

Clinton Bastin, NE-443
Julian R. Biggers, AL
James G. Bisker, EH-313
Don Boyce, NV
Michele Chavez, KAO
Paul Cote, RFO
Victor 1, Crawford, EH-24
Richard L. Dailey, EH–231
Kim Delman, AL
Nancy Demond, BPA
Joseph DiMatteo, CH
Howard Etkind, FERN
Robert W. Everson, EH-30.3
Cheryl Floreen, ID
Jennifer Francis, AL
Chuck Gilbert, DP-9
Harvey Grasso, OAK
Rebecca F. Hansen, EH–321
Karen Harness, GFO
Don Harvey, DP–624
Brenda W. Holder, EH-41
Darrell A. Huff, EH-331
Donna Jackson, SR
Vishwa Kapila, EH-331
Michael A. Kilpatrick, EH-24
John Kovach, METC
Joe Krupar, EH-30.3
Jay Larson, ER-6
Leonard M. Lojek, EH-321
Oliver D.T. Lynch, Jr., EH-32
Daniel J. MarSick, EH-312
Kenneth Mathias, WAPA
Gerald E. Meyers, EH-313
Don Michaelso.n, ID
Kenneth G. Murphy, EH–331
Van Nguyen, ER-6
Bradley A, Peterson, EH–321
Jim Poppiti, EM-36
Mark S. Robinson, OR
Marty Seitz, EM-60
John Sourbeer, PETC
Erwin Spickler, EM–23
Michael Teresinski, ER-13
Robert Vrooman, DP–62
Al White, FE–6
Patricia R. Worthington, EH–12

DOE Contractors and Subcontractors

Gary Adams, BNL
Lisa Alexander, PMI
Richard Antepenko, MMES-Pinellas
Jack Barley, LBL
Rex Beach, LLNL
Larry Boyer, Battelle-Pantex
Michael Brooks, EG&G-RF
Lillian Bromfield, PMI
Del Bunch, MSI
Martha Dunn, PMI
Howard Goldin, BDM Federal
Bill Griffing, NREL
Tim Harvey, Roy F. Weston, Inc.
H. Mac Hayes, PPPL
Glenn Hoenes, Battelle-PNL
Paul Hoffman, Westinghouse-WIPP
Paul Hogroian, SAIC
Billie J. Holler, PMI
L.G. Hulman, Viking
Peggy Hunt, Battelle-Seattle
Jim Jackson, LLNL
David Johnson, PM I
Ed Kahal, WSRC
Thomas Kevem, PMI
Bernard Kokenge, BRK Associates
Fred Krach, FERMCO
John Krsul, ANL-W
Todd Lewis, Babcock and Wilcox
Frank Loudermilk, SNL
Jennifer Macauley, Battelle-Seattle
Julie Magness, EG&G Mound
Dick Meador, Battelle-Seattle
Mary Meadows, EMA
Leon H. Meyer, LHM Corp.
Christine Muller, Arthur D. Little

G.T. Paulson, WINCO
John Piatt, Battelle-PNL
Bryan Raughley, Roy F. Weston, Inc.
Lucille Reau, PM I
Cecellia Rogers, PMI
Steve Rohrer, EG&G Energy
Measurements
Carmen Romano, EG&G-METC
Tom Rudolph, WHC
Saleem Salaymeh, WSRC
Jack Salazar, LBL
Jeffrey Schinkel, LANL
John Schmerber, MK-Ferguson
Ann Schubert, WVNS
David W. Sheffey, MMES
Doug Shoop, WHC
Bob Skier, REECO
Lindy Smith, Battelle-Seattle
John S. Stone, KEH
Gary Street, WSRC
Pamela Sutherland, Battelle-Columbus
Gary Swearingen, Battelle-PNL
Donna J. Thompson, PMI
Dada Treat Courtney, EMA
Carol Vega, MSE
Larry Warren, Evergreen
Innovations, Inc.
James L. Woodring, ANL
Tommye Wright, Battelle-PNL
Bill Zwick, LANL

Other

David Lowe, DNFSB

CHEMICAL SAFETY VULNERABILITY WORKING GROUP
INITIAL MEETING

Gaithersburg Hilton
March 1-2, 1994

AGENDA

March 1, 1994

7:30-8:30	Seminar Registration	
8:30-9:00	Opening Remarks	J. Fitzgerald
9:00-9:45	Project Approach/Status	M. Kilpatrick
9:45-10:00	Break	
10:00-10:45	Definition of Vulnerabilities	O. Lynch
10:45-11:45	Define Breakout Group Process	Facilitators
11:45-1:00	Lunch	
1:00-5:00	Breakout Sessions	Facilitators

- Breakout Groups 1 & 2- Establish Question Set for Field Self-Evaluations (DOE Contacts: Darrell Huff, EH-331, and Pat Worthington, EH-12)
- Breakout Group 3- Establish Process for Field Self-Evaluations and Field Verification Visits (DOE Contact: Bob Everson, EH-30.3)
- Breakout Group 4- Establish Process for Characterization and Prioritization of Chemical Safety Vulnerabilities (DOE Contact: Vic Crawford, EH-24)
- Breakout Group 5- Establish Process for Development of Management Response Plan (DOE Contact Brad Peterson, EH-321)

5:00-5:30	Break (Refreshments served)	
5:30-6:30	Review of Tomsk-7 Incident*	C. Gilbert
6:30-7:00	ORPS Chemical Safety Lessons Learned*	K. Murphy
7:00-7:30	Other EH Chemical Safety Initiatives*	K. Murphy

* Evening plenary sessions are optional. Designated breakout group leaders prepare for following day's presentations.

CHEMICAL SAFETY VULNERABILITY WORKING GROUP
INITIAL MEETING

AGENDA

March 2, 1994

8:00-8:20	Presentation of Breakout Group 1	Group Leader
8:20-8:40	Presentation of Breakout Group 2	Group Leader
8:40-9:20	Discussion - Question Set	All
9:20-9:40	Presentation of Breakout Group 3	Group Leader
9:40-10:10	Discussion - Field Self-Evaluation and Verification Process	All
10:10-10:30	Break	
10:30-10:50	Presentation of Breakout Group 4	Group Leader
10:50-11:20	Discussion - Prioritization of Vulnerabilities Process	All
11:20-11:40	Presentation of Breakout Group 5	Group Leader
11:40-12:10	Discussion - Management Response Plan Process	All
12:10-1:30	Lunch	
1:30-2:00	Schedule of Future Project Activities	R, Hansen
2:00-3:00	Wrap-up and Summary	M. Kilpatrick
3:00	Adjourn	

Attachment 3

PROJECT SCHEDULE

February 9, 1994	Letter from the Assistant Secretary for Environment, Safety and Health (EH-1) to all departmental elements establishing the Chemical Safety Vulnerability Working Group and providing specific goals.
February 14, 1994	Letter from the Secretary of Energy to the Assistant Secretary for Environment, Safety and Health tasking EH with the lead responsibility for conducting a thorough assessment of the chemical safety vulnerabilities associated with Department of Energy (DOE) facilities.
March 1-2, 1994	Working Group meeting held in Gaithersburg, Maryland, to obtain input for project plan from line management (both DOE and contractor organizations).
March 318	Field personnel conduct preliminary work and initiate self-evaluations using draft self-evaluation question set.
March 3-April 4, 1994	Core group personnel develop guidelines for conducting field verification visits, assign team leaders, and staff field verification teams.
March 8, 15, 22, 29, 1994	Conference calls conducted to facilitate field self-evaluation process. Calls will accommodate up to 60 participants. (To participate, call 301-903-7079 at 1:30 **p.m., Eastern time.)**
March 18, 1994	Issue "Project Plan for the Chemical Safety Vulnerability Review." Send final copy of project plan with transmittal letter from the Assistant Secretary for Environment, Safety and Health to field and program management elements.
March 18-April 1, 1994	Conduct field self-evaluations at designated facilities using established question set. Field self-evaluations will be forwarded to the Working Group through local DOE line management organizations, which will ensure the accuracy and completeness of the data submitted.
April 4, 1994	Field self-evaluation inputs due to Deputy Chairperson of the Working Group. (Send to EH–321.) Both hard copy and electronic version (preferably in WordPerfect® 5.1) should be forwarded.
April 5–7, 1994	Core group meeting held in Germantown, Maryland, to review self-evaluation input and to select candidates for field verification visits.
April 11, 1994	**Notify sites that will be visited as part of the field verification phase.**

April 18-27, 1994	Three field verification teams make first round of visits to three selected sites.
May 2–1 1, 1994	Three field verification teams make second round of visits to three selected sites.
May 16-25, 1994	Three field verification teams make third round of visits to three selected sites.
May 31–June 3, 1994	Core group meeting in Germantown to categorize and prioritize complex-wide chemical safety vulnerabilities.
June 1, 1994	Site management response plans for facility-specific vulnerabilities due to Deputy Chairperson of Working Group (in care of EH-321).
June 6-July 29, 1994	Draft final report. Conduct parallel process to develop management response plan.
June 7–8, 1994	Working Group meeting to review categorization and prioritization of complex-wide chemical safety vulnerabilities and to develop input for the overall management response plan.
June 9-July 29, 1994	Draft management response plan.
June 30, 1994	Draft report and management response plan to Joseph E. Fitzgerald, Jr., Deputy Assistant Secretary for Safety and Quality Assurance (EH-30).
Jldy 8, 1994	Draft report and management response plan to Dr. Tara O'Toole, Assistant Secretary for Environment, Safety and Health.
July 15, 1994	Final report and management response plan to printer.
Juty 29, 1994	Final report and management response plan due to Hazel R. O'Leary, Secretary of Energy.
July 29, 1994	Study of organic-oxidizer explosion vulnerabilities scheduled for completion by the Office of Defense Programs.

Attachment 4

LIST OF SELECTED SITES AND FACILITIES

Albuquerque Operations Office	Facility Codes
Los Alamos National Laboratory (DP)	
Gas Cylinder Distribution Plant, Building TA-3-170	5
Tritium High Pressure Lab, Building TA-33-86	4
Waste Storage Facilities, Technical Area 54	6
S–Site Explosives Blending Facility, Building TA-1 6-0342	1,3
Chemical and Metallurgy Research Facility, Building TA-3-29	3,4
Sandia National Laboratory (DP)	
Microprocessor Development Laboratory, Building 858	3
Laboratory Facilities, Buildings 805, 806, and 807	1
Process Development Laboratory, Building 878	3
Hazardous Waste Management Facility, Building 958	6
Light Initiated Explosive Test Facility	1
Mound Plant (DP)	
Process/Laboratory Facility, WD and WDA Buildings	1
Hazardous Waste Storage, Building 72	6
PETN Recrystallization Facility, Building 27	3
Explosives Formulation Facility, Building 1	4
Pantex Plant (DP)	
Sewage Treatment Facility, Building 13-47	8
High Explosives Synthesis Facility, Building 11-36	3
Explosives Machining Facilities, Buildings 11-50 and 12-24N	3
Kansas City Plant (DP)	
Tank Farm	6
Storage Facilities (Acid pad, Lot L, and Red X)	6
Industrial Waste Water Pretreatment Plant	8
Pinellas (DP)	
Tank Farm at the Liquid Waste Storage Area near Building 1000	6
Industrial Wastewater Neutralization, Building 550	8

Chicago Operations Office	Facility Codes
Argonne National Laboratory-East (ER)	
Chemistry Division, Building 200 (M-Wing Hot Cells)	1
Chemistry Technology, Building 205 (IFR Pyroprocessing)	1
Waste Ion Exchange Facility, Building 579	11
Argonne National Laboratory-West (NE)	
Operations Laboratory Facility, Building E 752	1
Brookhaven National Laboratory (ER)	
Hazardous Waste Storage Facility	6
Wastewater Treatment Facility, Building 575	8
Tank 490-07	11
Fernald Field Office	
Femald Environmental Restoration Management Corporation (EM)	
Bulk Chemical Storage (HF Tank Car)	5
Biodenitrification Facility (Tower, Building 18d; Sulfuric Acid Tank; Methanol Tank, Facility 18j)	4
Silo 3	**10**
Water Treatment Plant, Buildings 20A and 206	8
Golden Field Office	
National Renewable Energy Laboratory (EE)	
R&D Laboratory, Denver West Office Park, Building 16	1
Field Test Laboratory Building, South Table Mountain Site	1
Idaho Operations Office	
Idaho National Engineering Laboratory (NE/EM/DP)	
Army Reentry Vehicle Facility Site (ARVFS)	10
RWMC (Waste Storage Pad A, Waste Disposal Pit 9)	7
Power Burst Facility, Corrosive Waste Disposal Evaporation Pond	11
Argonne Experimental Facility, Waste Management Building 603	11

	Facility Codes
Idaho National Engineering Laboratory (cont.)	
ICPP Tank Farm	6
ICPP Fuel Processing Facility, Buildings 601–602	4
West Valley Demonstration Project (EM)	
Analytical Environmental Laboratory	**4**
Supernate Treatment System	**4**
Hazardous Waste Storage Locker	**4**
Morgantown Energy Technology Center	
Morgantown Energy Technology Center (FE)	
Chemical and Gas Storage B-1 6	
Wastewater Treatment Facility	
Nevada Operations Office	
Nevada Test Site (DP)	
North Las Vegas Facility, Building 710	1
Area 23, REECO Facility, Analytical Laboratories	1
Area 25, Flammable Storage Dock at Building 4320	11
Area 25, Acid Storage Tank at Nuclear Engine Test Stand	11
Oakland Operations Office	
Lawrence Berkeley Laboratory (ER)	
Microelectronic Research Systems Laboratory, Building 70-A	1
Lawrence Livermore National Laboratory (DP)	
Chemistry Processing Facility, Site 300, Building 827	**2**
Chemical and Materials Sciences Facility, Building 235	1
R&D Laboratory for Explosives, Buildings 222-229	4
Energy Technology Engineering Center (NE)	
RDM Facility, Buildings 020 and 029	9
Kalina Facility	3
Sodium Storage	**7**

	Facility Codes
Oak Ridge Operations Office	
Y-1 **2** Plant (DP)	
Hazardous Materials Bulk Storage, Building 9201-4	5
Compressed Gas Storage, Main Warehouse, Building 972*5	5
Oak Ridge National Laboratory (ER)	
Hazardous Waste Site (Emergency Waste Pond, 7821; Chemical Waste Evaporator Buiiding, 3506; and Contractor Landfill, 7658)	6
K-25 Site (EM/NE)	
Ponds Waste Management Project	7
Lithium Storage Vaults, Building K-25	6
Contaminated Burial Ground	11
Petroleum Reserves	
Naval Petroleum Reserve in California (FE)	
35R Complex	
Strategic Petroleum Reserve (FE)	
West Hackberry Facility	
Pittsburgh Energy Technology Center	
Pittsburgh Energy Technology Center (FE)	
Wastewater Treatment Facility	8
Power Marketing Administrations	
Bonneville Power Administration (DS)	
Ross Maintenance Facility (Heavy Duty Equipment Garage; Hazardous Material/Waste Storage, Treatment, and Disposal Facility)	3
Western Area Power Administration (DS)	
Phoenix Maintenance Facility (Heavy Duty Equipment Garage; Hazardous Material/Waste Storage, Treatment, and Disposal Facility)	3

Richland Operations Office	Facility Codes
Hanford (EM/ER)	
Plutonium Laboratory Facility, Building 234-5Z	**4**
Energy Laboratory, Building 2703 E	**2**
Chemical Energy (High Bay), Building 324	**2**
Life Sciences Laboratory, Building 331	1
PUREX Plant	**4**

Rocky Flats Office

Rocky Flats Plant (DP/EM)	
Waste Storage and Analytical Laboratory, Building 371	**1,6**
Warehouse and Machine Shop, Building 551	**3**
Analytical Laboratory, Building 559	1
Analytical Laboratory, Building 881	**7**
Industrial Waste Storage Tank, Building 207	10

Savannah River Operations Office

Savannah River Site (DP)	
400-D Area, Heavy Water Extraction Facility	**3**
200-H Area, Maintenance Facility, Building 299	**3**
ITP/ESP, Waste Reduction/Wastewater Facility	**3**
H-Area Tank Farm, Waste Reduction Facility	**3**
200-F Area, CTS Pits and Facilities, No. 242-003	**9**
100-P Area, Sodium Hypochlorite Facility, No. **186-001**	**9**

NOTE: Cognizant Secretarial Offices and Facility Codes are defined as follows:

DP = Office of Defense Programs
DS = Office of the Deputy Secretary
EE.= Office of Energy Efficiency and Renewable Energy
EM = Office of Environmental Restoration and Waste Management
ER = Office of Energy Research
FE = Office of Fossil Energy
NE = Office of Nuclear Energy

1 = Operating or shutdown laboratory
2 = Operating or shutdown pilot plant
3 = Operating process facility
4 = Shutdown or standby process facility
5 = Operating chemical storage facility
6 = Operating waste storage/disposal facility
7 = Shutdown waste storage/disposal facility
8 = Operating utility
9 = Shutdown EM facility
10 = Transition EM facility
11 = Abandoned facility

Attachment 5

FACILITY SELECTION CRITERIA

BACKGROUND

Field self-evaluations will be the primary mechanism by which identification and characterization of adverse conditions or circumstances involving potentially hazardous chemicals will be determined at facilities owned or operated by the Department of Energy (DOE).

Field self-evaluation question sets (see Attachment 6) developed by the Chemical Safety Vulnerability Working Group will be distributed to 84 facilities at 29 DOE sites. The question sets will be used to collect specific information related to the handling, storage, use, and disposal of hazardous chemicals and waste. After completion of the field self-evaluations, nine DOE sites will be selected for field verification visits by teams of safety professionals representing the Working Group.

Core group personnel assigned to the Working Group used the criteria described in this attachment to select facilities and sites for participation in the field self-evaluations.

CRITERIA FOR SELECTION OF FACILITIES FOR SELF-EVALUATION

Identification of vulnerabilities arising from hazardous chemicals and wastes at DOE sites requires examination of all types of chemical- and waste-handling facilities, including laboratories, process facilities, and waste treatment and storage facilities.

Selection of Candidate Facilities

To begin the selection process, Operations Managers and Site Representatives assigned to the Office of Safety and Quality Assurance (EH–30) were asked to identify candidate chemical- and waste-handling facilities from the sites for which they have oversight responsibility. The Operations Managers and Site Representatives provided summary information about these facilities to core group personnel, who then evaluated the information and selected a cross-section of facilities for participation in the field self-evaluations.

Operations Managers and Site Representatives used their professional judgment and knowledge of DOE sites to recommend candidate facilities. For each selected site, the Operations Managers and Site Representatives recommended up to 10 facilities as candidates for participation in the field self-evaluations. The facilities recommended by the Operations Managers and Site Representatives met the definition of candidate facilities provided below.

In situations where a selected site included multiple candidate facilities with similar profiles (i.e., facilities containing the same chemicals or wastes and performing the same operations or functions), the Operations Managers and Site Representatives used their knowledge and professional judgment to recommend individual facilities for participation in the field self-evaluations.

Definition of a Candidate Facility

For the purpose of selecting candidate facilities for field self-evaluation, a candidate facility is defined as a process facility, laboratory, handling operation ,storage facility, or waste area that meets one or more of the following criteria:

Type A Contains hazardous (toxic, flammable, or explosive) chemicals with inventories exceeding approximately 25 percent of the threshold quantities stipulated by the Occupational Safety and Health Administration (OSHA).'

*Type **B*** Contains chemical mixtures, byproducts, intermediate products, or other products that have evolved as a result of process upset for which constituents are hazardous, as defined above, and exist in quantities exceeding the percentages stipulated by OSHA.'

Type **C** Contains large numbers of hazardous or unknown chemicals in small quantities.

Type *D* Contains characterized hazardous waste or mixed waste.

Type E Contains wastes whose constituents are unknown.

This list of chemical and waste facility characteristics is not provided in order of rank. Rather, it attempts to capture probable types of facilities that should be included in the current review. Thus, Types A and B will probably include process facilities, pilot plants, chemical storage facilities, and utilities. Most Type C facilities will probably be laboratories. Types D and E will probably include waste-handling, treatment, and storage facilities. Because Type E facilities (which contain wastes with unknown constituents) are inherently vulnerable, they have been identified separately from Type D facilities (which house wastes that have been characterized as hazardous or mixed).

There are probably fewer Type A and B facilities in the DOE complex than Type D and E facilities. Therefore, Type A and B facilities were more likely to be identified and selected by Operations Managers and Site Representatives as candidates for self-evaluation. However, the Operations Managers and Site Representatives used their knowledge, expertise, and best judgment to select representative examples of all five facility types.

Summary Information for Candidate Facilities

At selected sites, Operations Managers and Site Representatives designated up to 10 candidate facilities containing hazardous chemicals and hazardous wastes, providing the following information for each:

- Facility name;
- Facility location;
- DOE field organization and management and operating contractor
- Type of facility (e.g., laboratory, pilot plant, waste storage facility);
- Operating status;
- Approximate inventory of hazardous chemicals or hazardous wastes (types and quantities); and
- Preliminary characterization of chemical hazards.

FACILITY SELECTION PROCESS

A small team of core group personnel reviewed the information provided by the Operations Managers and Site Representatives and selected a limited cross-section of these facilities and sites for participation in the field self-evaluations.

At least three of each of the following candidate facilities were selected using the criteria described above:

- Operating or shutdown laboratory;
- Operating or shutdown pilot plant;
- Operating process facility;
- Shutdown or standby process facility;
- Operating chemical storage facility;
- Operating waste storage/disposal facility;
- Shutdown waste storage/disposal facility;
- Operating utility (e.g., water treatment facility);
- Shutdown facility under the cognizance of the Office of Environmental Restoration and Waste Management (EM) (undergoing decontamination and decommissioning, or D&D);
- Transition facility under EM cognizance (not yet undergoing D&D); and
- Abandoned facility.

In addition, facilities at each site that gave rise to serious concerns about chemical hazards were included, as follows:[2]

- Facilities (maximum of five) experiencing serious or frequent chemical accidents within the past 2 years.

- Facilities (maximum of five) for which the Office of Environment, Safety and Health had conducted comprehensive chemical safety evaluations within the past 2 years.

- Facilities determined to contain large quantities or large numbers of hazardous or unknown chemicals (i.e., identified during the EM Surplus Facility Inventory and Assessment Project).

NOTES

[1] The list, contained in the November 22, 1993, memorandum issued by Assistant Secretary Tara O'Toole to Cognizant Secretarial Offices and DOE Operations Office Managers, "Survey of Chemical Processes within the Department of Energy (DOE) Complex," specified chemicals and threshold quantities regulated by OSHA (see 29 CFR 191O.119, "Process Safety Management of Highly Hazardous Chemicals") and by the Environmental Protection Agency (see 40 CFR 68, "Risk Management Programs for Chemical Accidental Release Prevention").

[2] These facilities need not be identified by Operations Managers or Site Representatives as candidate facilities. Information on chemical accidents and incidents at DOE facilities, including facilities experiencing serious or frequent chemical accidents within the past 2 years, was identified by John Usher of Brookhaven National Laboratory. Information on facilities undergoing comprehensive chemical safety evaluations within the past 2 years was obtained, in part, from DOE/EH-0282, "Task Group Report to the Assistant Secretary for Environment, Safety and Health on Oversight of Chemical Safety at the Department of Energy," dated November 1992.

ATTACHMENT 6

FIELD SELF-EVALUATION QUESTION SET

This question set should be applied to the Department of Energy (DOE) operation that you will describe in Question 1 below. Each question should be answered completely, using all applicable elements listed.

For Questions 1-4, provide sufficient detail (1) to provide accurate definitions of environment, safety, and health (ES&H) concern(s) relative to existing or projected conditions; (2) to note where elements have not been programmatically addressed or where a significant level of knowledge about the elements is lacking; and (3) to provide sufficient information to perform the vulnerability identification discussed in the project plan.

1. **Identify the facility. (See Attachment 4 for a list of selected facilities.) What is the condition of the facility associated with the DOE operation being evaluated? Provide the following information for the facility.**

   (a) What is the name and identifying number (or other designator) of the facility? Briefly describe the facility, including its size or capacity.

   (b) Identify the cognizant DOE Program Office, DOE field organization, facility representative, management and operating contractor, environmental restoration management contractor, and previous contractors responsible for this facility.

   (c) What is the current (or most recent) mission of the facility? (Use the following terminology to describe the facility mission.)

   Mission of Facilitv
   Process facility
   Nuclear reactor
   Assembly/Disassembly facility
   Pilot plant
   Machinery/General industry
   Laboratory
   Plating
   Chemical storage facility or warehouse
   Utility
   Waste storage facility or site
   Waste treatment facility
   Waste disposal facility or site
   Waste/environmental remediation area

(d) What is the current life cycle phase? (Indicate all that apply and explain.)

Operational Status of the Facility
Operating
Abandoned
Inactive-standby
Inactive-shutdown
Undergoing D&D
Surveillance and maintenance
Deactivation
Deinventory
Other (Provide a brief explanation.)

(e) What was the original function (as initially constructed) of the facility? Has the facility been used for other functions since it was constructed? Identify.

(f) Are there chemical safety concerns associated with the facility because of the codes and standards to which is was built or modified. If so, explain.

(9) Is the mission of the facility expected to change within the next 3 years? If so, how?

(h) What is the shortest distance from this facility to the site boundary?

(i) Provide the number of occupants normally expected to be located within this facility. Provide an estimate of the number of people normally expected to be within 100 meters of the facility.

(j) Provide additional comments that you may have or concerns regarding the physical condition of the facility that may involve a chemical safety concern.

2. **Describe the chemical inventory of the facility.**

(a) Characterize the quality of existing chemical inventoty data for the following (use a one-word description, followed by a short explanation of the basis):

- Hazardous chemicals;
- Hazardous wastes (including mixed wastes); and
- Chemical residuals.

(b) Describe the facility hazardous chemical inventoty as follows:

- Are hazardous chemicals present in quantities that meet or exceed 25 percent of those listed in either 29 CFR 1910.119 or 40 CFR 68? If so, complete Table 1.

- Are hazardous chemicals (below the 25-percent threshold stipulated above) present that do not have adequate controls to prevent worker exposures? If so, complete Table 1.

* For nonoperating facilities, were operations terminated with hazardous chemicals still inline? If so, specify location and contents (if known) in Table 1.

- Identify any other concerns involving hazardous chemicals that were not covered above or that you believe need to be addressed. Specify these concerns and complete Table 1 for these chemicals.

(c) Describe the hazardous waste inventory as defined in 40 CFR 261, Subpart D, or in more stringent State regulations, where applicable.

- Does the facility contain waste that has not been characterized? Briefly provide any information known about the waste (e.g., quantity or physical state).

- Does the facility currently generate hazardous waste? If so, explain and give the current rate of generation.

- Is hazardous waste stored in the facility? If so, explain. Are adequate controls in place? If not, complete Table 1.

- Does the facility contain mixed waste? If so, give total volume. Provide relevant information that is not already included in Table 1.

- Is this a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) or environmental restoration site? Has it been characterized? If so, to what extent? If characterized, complete Table 1. If uncharacterized describe situation and existing plans or controls.

- Does the facility contain waste covered by the DOE moratorium? If so, provide total volume.

(d) Describe hazardous chemical residuals at the facility.

- Are hazardous chemical residuals present on or in systems, structures, or components? Briefly describe conditions and types (i.e., characteristics) of these chemicals.

* Are there chemical safety concerns because of these residuals? If so, describe.

(e) Provide additional comments or concerns that you may have regarding the inventory of hazardous chemicals or hazardous waste stored in the facility.

---

[3] The DOE Office of Waste Operations (EM-30) issued a moratorium on the shipment of hazardous waste from radiologically contaminated or potentially contaminated areas at DOE sites to offsite facilities not licensed for radiological material. See memorandum from Jill E. Lytle (EM-331) to Distribution, "Shipment of Waste Originating in Radiation Control Areas," dated May 17, 1991.

3. What programs and management systems (e.g., conduct of operations and institutional controls) are in place to control the risks associated with the hazardous processes, chemicals, or wastes identified in Question 2.

(a) Identify program and management systems for the facility that pertain to chemical safety. Fill in Table 2 as applicable. (Note the following examples.)

Safe work program
Safety analysis
Emergency operating procedures or plan
Training and qualifications
Preventive maintenance
Radiation protection (if applicable)
Industrial hygiene program
Industrial safety program
Quality assurance
Conduct of operations implementation plan
Hazard analysis
Management plans (e.g., management response plans)
Environmental analysis
Transition plan
Decommissioning and demolition plan
Environmental restoration plans
Industrial hygiene survey

(b) Are there significant regulatory drivers, such as DOE Orders or required permits, associated with the programs and management systems in 3(a) above? Complete Table 2 as applicable. (Note the following examples.)

Statutory requirements
Environmental agreements, certifications, and permits (including time constraints)
Federal and State agreements

(c) For programs and systems identified in Question 3(a), provide a brief summary of associated documents and their adequacy.

(d) Describe any other programmatic and management concerns related to chemical safety.

4. **Have there been any reportable events involving hazardous material within the past 4 years?**

(a) Briefly describe any Type A or Type B investigations and provide the appropriate references. Provide the number of events that led to Type C investigations. Describe (only as an overall summary) the Type C investigations for the sample period. Refer to DOE 5484.1, "Environmental Protection, Safety, and Health Protection Information Reporting Requirements," Chapter 1, issued June 29, 1990, for definitions of accidents types.

(b) Are there any unresolved issues related to any events that led to the Type A or Type B investigations identified above? If so, briefly describe.

(c) Briefly describe any unusual occurrences (as defined by DOE 5000.3B, “Occurrence Reporting and Processing of Operations Information,“ issued May 30, 1990) involving chemicals.

(d) Briefly describe any workplace conditions that contributed to, or may contribute to, worker exposure to chemicals above applicable exposure levels.

5. **Describe the ES&H concerns related to chemical safety at the facility that require the most immediate attention.**

6. **(Optional) Share any commendable programs or practices related to chemical safety.**

TABLE I -HAZARDOUS CHEMICAL AND WASTE INVENTORY

HAZARDOUS CHEMICAL, WASTE NAME OR CHARACTERISTIC (for CERCLA sites)	QTY (LBS)	FORM	CHARACTERISTIC (DOT)	CONDITION OF CHEMICAL	LOCATION	NUMBER of CONTAINERS/ EQUIPMENT	CONDITION+4 of CONTAINERS/ EQUIPMENT	EXISTING DISPOSITION PLAN YIN	EXISTING CONTROL PROGRAM YIN	COMMENTS OR CLARIFYING REMARKS

NOTE: Instructions for filling out the form are on the back

HAZARDOUS CHEMICAL; WASTE NAME OR CHARACTERISTICS	Enter the name as given in 29 CFR 1910.119 or 40 CFR 68. If the chemical form is not yet known, enter “unknown” in this field. For CERCLA or environmental restoration sites, include information based on characterization.
FORM	Enter “L for liquid, “S” for solid, and “G” for gas. If the material is declared as waste, also enter “MW for mixed waste and “W for nonmixed waste (e.g., S-MW).
CHARACTERISTIC	To complete this column, refer to definitions provided in DOE 5480.3, “Safety Requirements of Packaging and Transportation of Hazardous Materials, Hazardous Substances, and Hazardous Waste,” issued July 9, 1985.
LOCATION	Enter a brief code that describes the current storage location within the facility. If necessary, provide a simple coded map of the facility to facilitate understanding the codes that are provided.
CONDITION OF CHEMICAL	Condition of chemicals (e.g., aging, unstable, deteriorating)
CONDITION OF CONTAINERS/ EQUIPMENT	Enter “G” for good, “F” for fair, and “P for poor. If conditions of containers vary, give the number of containers in each category (e.g., 2-G, 3-F, l–P).
EXISTING DISPOSITION PLAN	If the answers is “Y,” provide a comment reference for the document(s) that contain the associated disposition plan(s).
CONTROL PROGRAM IN PLACE	If “Y” provide comments or references. May also reference other responses within this questionnaire.
COMMENTS/ CLARIFYING REMARKS	(as necessary)

TABLE2-MANAGEMENT SYSTEMS

Program/Management Systems	Facility Document References	Significant Drivers

Attachment 7

CHEMICAL SAFETY VULNERABILITY PRIORITIZATION CRITERIA

The criteria in this attachment are intended to provide chemical safety professionals with general guidelines by which informed judgments can be made about the significance of identified chemical safety vulnerabilities. These criteria will be used by field verification teams to prioritize faciliy-specific vulnerabilities and by the EH core group to prioritize generic (i.e., complex-wide) vulnerabilities.

A vulnerability will be determined to exist if current or expected future conditions or weaknesses could result in the following:

- The death of or serious physical harm[4] to a worker or a member of the public or continuously exposing a worker or member of the public to levels of hazardous chemicals above hazardous limits; or

- Environmental impacts through the release of hazardous chemicals to the environment above established limits.

Vulnerabilities should first be prioritized based on the timeframe within which the consequences are expected to occur. The following categories should be used:

- Immediate Consequence - Any chemical safety vulnerability that could result in immediate consequences.

- Short-Term Consequence - Any chemical safety vulnerability at a facility in which there is a significant chance of a consequence occurring within a 3-year timeframe as a result of chemical degradation, change in mission for the facility, degradation of the containment systems, change in personnel at the facility, or other factors affecting the facility.

- Medium-Term Consequence - Any chemical safety vulnerability at a facility in which there is a significant chance of a consequence occurring in a 3-1 O-year timeframe as a result of chemical degradation, change in mission for the facility, degradation of the containment systems, change in personnel at the facility, or other factors impacting the facility.

- Long-Term Consequence - Any chemical safety vulnerability at a facility in which there is a significant chance of a consequence occurring in the timeframe greater than 10 years as a result of chemical degradation, change in mission for the facility, degradation of the containment systems, change in personnel at the facility, or other factors impacting the facility.

---

[4] Serious physical harm is defined as impairment of the body, leaving part of the body functionally useless or substantially reducing its efficiency on or off the job.

Within each category, the vulnerability should be further prioritized. Vulnerabilities should be specified as “high,” “medium,” or “low” priority based on the potential severity of the consequence. Examples of how vulnerabilities should be further prioritized include the following:

- Potential worker or public harm could be further prioritized based on the possible level of injury and/or health effects, ranging from transient reversible illness or injury to death.

- Environmental impacts could be further prioritized based on the level of irreversible damage and/or restoration costs.

APPENDIX C

FIELD VERIFICATION GUIDE
FOR THE
CHEMICAL SAFETY VULNERABILITY REVIEW

Issued: April 8, 1994

OFFICE OF ENVIRONMENT, SAFETY AND HEALTH

Field Verification Guide
for the
Chemical Safety
Vulnerability Review

Prepared by:

Victor I. Crawford
Team Leader

Leonard M. Lojek
Team Leader

Bradley A. Peterson
Team Leader

Reviewed by:

Rebecca F. Hansen
Deputy Chairperson;

Approved by:

Michael A. Kilpatrick
Co-Chairman

Oliver D.T. Lynch, Jr.
Co-Chairman

CONTENTS

ATTACHMENTS

1.0 Introduction

Based on direction from the Secretary of Energy,[1] the Assistant Secretary for Environment, Safety and Health established the Chemical Safety Vulnerability Working Group to identify, characterize, and prioritize chemical safety vulnerabilities confronting the U.S Department of Energy (DOE).[2] The Secretary's guidance required that special emphasis be given to review of facilities being transferred to, awaiting, or undergoing decontamination and decommissioning. In response, a project plan describing the six phases of the review and establishing a schedule for its completion has been developed and distributed to all affected Departmental elements.[3] A final report on the results of the review is due to the Secretary by July 29, 1994.

This document provides specific guidance to Working Group members, site personnel, and team members participating in the field verification phase of the Chemical Safety Vulnerability Review (also see "Phase III - Field Verification" in the project plan). The field verification process is designed to use independent teams of technical professionals with experience in a variety of environmental, safety, and health (ES&H) disciplines to verify the accuracy and completeness of the data compiled during the field self-evaluation phase of the review. The field verification process offers an opportunity to identify facility-specific chemical safety vulnerabilities and to make informed judgments about the seriousness of the conditions observed. However, the field verification process is not intended to be a site- or facility-specific compliance or risk assessment.

The field self-evaluation phase of the review used a standardized question set developed and distributed by the Working Group to collect data related to chemical safety from 84 facilities located at 29 DOE sites. Self-evaluations began in early March 1994, and the results were due to the Working Group by April 4, 1994. This information was used to make initial determinations about facility-specific chemical safety vulnerabilities and will be used by the field verification teams as a baseline for their field observations. When the self-evaluation data for a particular facility at a site selected to host a verification team indicate no significant concerns related to chemical safety, other appropriate facilities may be substituted for inclusion in the field verification effort.

On receipt of the completed self-evaluation reports, a core group of EH personnel representing the Working Group analyzed the data and selected nine DOE sites to host field verification visits. Field visits will last 10 days, with the three rounds of visits scheduled to begin on April 18, May 2, and May 16, 1994.

---

[1] Memorandum from Hazel R. O'Leary to Tara OToole, "Vulnerability Review of Chemical Safety at Department of Energy Facilities," dated February 14, 1994.

[2] Memorandum from Tara O'Toole to all Departmental Elements, "Vulnerability Review of Chemical Safety," dated February 10, 1994.

[3] "Project Plan for the Chemical Safety Vulnerability Review," dated March 14, 1994.

Each team will characterize and prioritize facility-specific chemical safety vulnerabilities at each site visited. Teams will identify vulnerabilities and their potential consequences. Consequences may be of immediate concern or may be projected to be of concern in the future. At the conclusion of each site visit, the team will draft a report of its observations and will conduct an outbriefing for local DOE and contractor line management personnel. Local DOE line organizations will be responsible for developing and approving corrective actions for facility-specific chemical safety vulnerabilities identified during verification visits. Vulnerabilities may be addressed either through an existing action plan or by a new entry into an appropriate tracking system.

2.0 Verification Methodology

The goal of each field verification visit is to develop a prioritized list of facility-specific chemical safety vulnerabilities for the site being reviewed. Before arriving at the site, review of the data provided during the field self-evaluation phase will allow team members to develop a list of observations related to potential vulnerabilities for their functional areas. During the onsite portion of the review, team members will visit facilities that participated in the self-evaluation effort to verify reported observations and to look for other conditions and circumstances that may result in chemical safety vulnerabilities. In some instances, facilities or areas that were not involved in the original self-evaluation may provide valuable information for the review. In these cases, team members will coordinate with their site counterparts to arrange for the appropriate walkthroughs or interviews. Finally, the team will prioritize all facility-specific chemical safety vulnerabilities identified for the site being reviewed.

2.1 Functional Areas

To facilitate effective team management and to expedite the identification of vulnerabilities across a wide range of technical disciplines associated with chemical safety, each field verification review has been organized to include five functional areas:

- Identification of chemical holdings, including the properties of chemicals located at the facility, the characterization of those chemicals, and an analysis of the inventory.

- Facility physical condition, including engineered barriers, maintenance conditions, chemical systems, safety systems, storage, monitoring systems, and hazards identification.

- Operational control and management svstems, including organizational structure; requirements identification; hazard analysis; procedural adherence; maintenance control; engineering and design reviews; configuration control; safe shutdown plans; and site programs for quality assurance, chemical safety, inventoty control, access control, disposal, transportation and packaging, and corrective actions.

- Human resource programs, including technical competence, staffing, training and qualifications, employee involvement, employee concerns, personnel performance requirements, and visitor and subcontractor control.

- Emergency response program, including the emergency response plan, inplant consequences, environmental issues, coordination with the community, and community right-to-know issues.

2.2 Lines of Inquiry

The lines of inquiry for each functional area, provided in Attachment 1, have been developed to guide individual team members in the conduct of their reviews. This approach will ensure that each team uses a common strategy for verifying self-evaluation data and identifying facility-specific vulnerabilities. The lines of inquiry have been coded to identify which team member has lead responsibility for reviewing each question. (See Attachment 2 for a matrix depicting the responsibilities of team members in individual functional areas.)

Although the lines of inquiry define the intended scope of the review, they do not restrict the reviewer's activities. The depth to which a reviewer examines issues associated with a given question or topical area should be based on the individual reviewer's professional judgment. The time spent on a specific issue should be directly proportionate to the likelihood that a vulnerability will be identified.

2.3 Preparation for Verification Visits

To ensure that time at the site is used effectively, team members for each technical discipline are instructed to develop individual review plans before their arrival. These plans should be brief and should provide a focus for activities conducted during the first few days of the onsite review. Review plans should include the following elements for each facility reviewed:

- A methodology for pursuing the lines of inquiry for which the team member has been assigned primary responsibility;

- A list of observations from field self-evaluation data that may involve chemical safety vulnerabilities and a plan for observing and verifying these observations;

- A list of suspect or incomplete data that may require verification (based on review of the field self-evaluation);

- A list of personnel or positions that may be candidates for interviews; and

- A list of proposed daily activities for the first 3 days of the field verification effort (i.e., for Monday through Wednesday of the first week).

A package of information (see Section 3.2 below) will be provided to each team member before the onsite portion of the verification to allow team members to familiarize themselves with their responsibilities. In addition, before departure for the sites, team members will receive training to familiarize them with the scope and methodology of the field verification process. Team members will brief the team leader on their individual review plans at the team's initial meeting on the first day. Each team member should turn in a copy of his or her individual review plan to the coordinator before 1:00 p.m., the first day on site.

2.4 Onsite Review Methodology

During the first half of the verification visit (Monday through Friday), team members should concentrate on conducting walkthroughs, interviews, and verifications to confirm field self-evaluation data and to observe conditions that may indicate potential chemical safety vulnerabilities. The second half of the verification visit will be used to (1) develop the draft field verification report for the site, (2) document and prioritize facility-specific chemical safety vulnerabilities, and (3) conduct a factual accuracy review with site personnel.

Each team member will work closely with an assigned site counterpart throughout the 10-day review. The site counterpart should be an ES&H professional who is knowledgeable of the programs and personnel associated with the assigned technical area. Each site counterpart will be asked to support a team member in the following manner:

- Answer the team member's technical questions or know where to find the answers;

- Arrange walkthroughs and interviews, as requested;

- Escort and observe the team member's interactions with site personnel (providing additional information or correcting inaccurate information, as appropriate);

- Serve as a liaison between the site and the team member; and

- Arrange for factual accuracy review of appropriate sections of the draft report by appropriate site personnel before factual accuracy review by site management.

During walkthrough of facilities, team members should look for good visual examples of chemical safety vulnerabilities. Team members should notify the team leader and coordinator of all good visual examples of vulnerabilities so that arrangements can be made for photographic support. Photographs of such vulnerabilities may be used in the Working Group's overall report.

The team will conduct meetings at the conclusion of each day to compare observations and identify conditions or circumstances that may involve chemical safety vulnerabilities. Observers representing local DOE and contractor organizations are permitted at these meetings. It should be noted, however, that the meetings will be held solely for the purpose of providing team members with an opportunity to discuss preliminary observations. Site personnel attending these meeting will not generally be invited to participate in the discussions.

Based on input received during the team meeting, team members will document observations using a standardized form (see Attachment 3). Observation forms are intended to provide a means for systematically recording relevant issues on a daily basis. (It should be noted that observation forms can be used for noteworthy practices as well as deficiencies.) One observation form will be used for each separate issue.

Each team member will be responsible for preparing observation forms associated with his or her area of responsibility and will turn them over to the coordinator by 8:30 a.m. each day. The coordinator will assign a unique number to each observation and make copies for distribution to the team leader and the technical editor. Because observation forms will be used solely as a means to record raw data, they will not be turned over to site personnel and will not be published. Observation forms should be updated throughout the first week of the review to reflect the most accurate and detailed information available. At the end of the first week, completed observation forms will be used by team members to develop facility-specific chemical safety vulnerabilities.

Team members and site personnel should work closely throughout the verification effort to ensure that team objectives are accomplished and that the impact on the site is minimized. Accordingly, a Working Group member from the site will be assigned as a member of the team. In addition, the team leader will provide local DOE and contractor management with a daily briefing to summarize the team's observations and to discuss other issues related to the verification visit.

The Working Group member representing the site will serve as a liaison between the team and the site but will not have responsibilities related to conducting the review. This individual will be asked to advise the team leader on issues related to minimizing the impact of the review on the site, conducting factual accuracy reviews, and resolving any conflicts that may arise. The Working Group member representing the site will be given full access to all team working papers; however, he or she will not be allowed to provide copies of these documents to other site personnel.

2.5 **Documentation of Chemical Safety Vulnerabilities**

At the end of the first week (Friday), the team will shift its focus from conducting the review to drafting the site report. A copy of the draft field verification report will be left with local DOE and contractor organizations before the team leaves the site. The body of the report will provide a summary of team activities and observations organized according to applicable functional areas. Detailed technical information to support this summary will be provided in chemical safety vulnerability forms attached to the report as an appendix. (See Attachment 3 for the vulnerability form and Attachment 4 for the report format.)

At the end of the first week of the review, the team will meet to finalize the list of identified facility-specific chemical safety vulnerabilities based on issues documented in observation forms. The team leader will then finalize the assignment of team members to draft chemical safety vulnerability forms. (Responsibility for drafting vulnerability forms may be assigned to team members earlier in the week when chemical safety vulnerabilities begin to be identified.) In addition, the team leaders will finalize the assignment of team members to draft sections of the main body of the field verification report.

Over the weekend, team members will work on drafting and editing their assigned sections of the field verification report and the chemical safety vulnerability forms for which they are responsible. (Guidance related to style for technical reports is provided in Attachment 5.) A peer review session will be held on Sunday afternoon. By Monday morning, team members will submit the third draft of their assigned sections to the coordinator for review by the team leader and the technical editor.

A factual accuracy review will be conducted by site personnel on Tuesday. Site personnel will be allowed to review controlled copies of the draft field verification report on Tuesday morning, at which time they can prepare questions and comments for the review team. Site personnel will not be allowed to make copies of this version of the draft report. On Tuesday afternoon, team members will make themselves available to their counterparts and other appropriate site personnel to discuss factual accuracy issues. Later in the afternoon, the team will meet with site management representatives (1) to discuss proposed changes to the draft report resulting from the team members' factual accuracy review with their counterparts and other site personnel and (2) to resolve remaining issues.

On Wednesday, the last day of the site visit, the team leader will conduct an outbriefing for site management. A copy of the draft field report, including pertinent appendixes, will be left at the site. Team members will attend this outbriefing to answer questions related to their areas of technical expertise.

Field verification reports will be considered final from a technical point-of-view when the team leaves the site. Editing to enhance presentation and to ensure consistency between the nine field verification reports may be done after the site visit.

3.0 Team Administration and Responsibilities

The team leader has overall responsibility for administering the field review team and for ensuring that the field verification visit is conducted according to the provisions of this guide. Changes related to the basic guidance provided herein should be approved by the Working Group Co-Chairmen, the team leader, or both,

During each round of reviews, team leaders will be required to coordinate with each other on a daily basis to ensure consistency between teams and to allow for immediate feedback on relevant issues. At a minimum, team leaders will conduct daily conference calls and provide each other with fax copies of draft reports.

3.1 Team Selection

Each field verification team will consist of a team leader, seven ES&H professionals, a Working Group member (serving as a liaison with the site), a technical editor, and a coordinator. The ES&H professionals will have technical expertise related to chemical safety in one or more of the following areas:

- Management systems,
- Human resources,
- Chemical processes,
- Facility maintenance,
- Industrial hygiene,
- Environmental protection, and
- Emergency preparedness.

Team members have been selected on the basis of their technical competence and experience. Several Working Group members representing line management organizations are being used as team members either as technical experts or as site liaison representatives. Team members will also be provided by the Office of Environment, Safety and Health. All team members will be screened for conflicts of interest. No individual may serve on a team visiting a site at which he or she has assigned line management responsibilities or contractual relationships, with the exception of site liaison representatives. To the extent possible, team members should be selected to participate in all three rounds of the field verification process, thereby ensuring continuity between site reviews. Team leaders have been selected from the list of DOE core group personnel (see Attachment 1 of the project plan for a list of core group personnel).

3.2 Preliminary Verification **Activities**

The compressed timeframe for this review requires that team assignments, site identification, and the verification process will occur in rapid succession. After the data from the field self-evaluations were reviewed, the Co-Chairmen of the Working Group immediately provided verbal and written notification to DOE line management at sites selected to host field verification teams. Contact was also established between team leaders and Working Group representatives at the selected sites. The core group member designated as the chief coordinator of the Working Group is responsible for making necessary arrangements for the team, including verification of hotel accommodations, administrative support, office space, and site counterparts.

The schedule for the verification visits does not include opportunities for advance, indepth study of site documents and programs or for specialized training. To provide team members an opportunity to prepare for their responsibilities, the following information will be provided to team members before travel to the site:

- The field self-evaluation data submitted by the site,
- Documents describing the objectives and methodology for the Chemical Safety Vulnerability Review,
- Applicable organizational charts for the sites and facilities being visited,
- The names and phone numbers of site counterparts,
- Data from the Occurrence Reporting and Processing System and other pertinent background information that will provide insights into facility-specific chemical safety vulnerabilities, and
- Information about hotel accommodations.

3.3 **Responsibilities of Team Members**

Team members' responsibilities relative to specific functional areas and technical disciplines are provided in Attachment 2. A team member will be assigned lead responsibility for each functional area and for each facility-specific chemical safety vulnerability identified in the field verification report.

Team members are responsible for being prepared to conduct the verification review when they arrive at the site. Each team member will develop an individual review plan as described in Section 2.0 above. Before arriving on site, each team member should contact his or her counterpart to make initial plans for the first few days of the review.

Team members will be responsible for documenting their own observations related to facility-specific chemical safety vulnerabilities on standardized observation forms as described in Section 2.0 above. Observation forms will be submitted to the coordinator each morning as established in the daily schedule. Observation forms will be used to prepare final documentation on facility-specific chemical safety vulnerabilities.

Team members should coordinate their activities in a manner that will minimize the impact of their presence on the site. This objective can be accomplished by working closely with the site liaison person and by providing proposed schedules of interviews and walkthroughs to the coordinator at least 2 days in advance. The coordinator will look for opportunities to combine these activities and will post schedules on a daily basis.

3.4 **Team Interaction with Site**

Each team member should approach the field verification review in the spirit of cooperation and openness. This review is not intended to be a compliance inspection, rather it is a fact-finding review to identify potential problems associated with chemical safety. Team members will be verifying data and identifying conditions and circumstances that may result in chemical safety vulnerabilities, not inspecting the site.

Each team member should work closely with his or her counterpart to ensure that cooperation and openness are maintained. Team members should be accompanied by their counterparts during all verification activities at the site. Counterparts will provide team members with information about site policies and procedures and will arrange for the operation of mechanical or electrical devices. Since the principal function of the field verification effort is to conduct observations and to verify self-evaluation data, team members are instructed not to “test” the site without obtaining the permission of both the team leader and the local DOE office.

Site personnel should be kept apprised of issues being raised by team members. Honest disagreements may persist about how a situation is perceived or how a requirement is interpreted, but site personnel should be given the opportunity to express their views and present their evidence to the team.

Team members employed by contractor or subcontractor organizations may not engage in any marketing activities while performing their duties at the selected sites. Team members must devote their full attention to verification activities, Participation by team members in any work activity not directly related to the verification review must be approved by the team leader. All discussions with site management that are not related to the verification must also be approved by the team leader.

3.5 Team Schedule

Each of three field verification teams will be assigned to visit three different sites. The first round of three site visits will begin on April 18, 1994; the second round will begin on May 2, 1994; and the third round will begin on May 16, 1994. To ensure continuity between each team and each round of reviews, a standardized schedule has been developed and is provided in Attachment 6. Based on the judgment of the team leader, minor changes for individual items on the schedule can be made to accommodate specific circumstances. It should be noted that site visits will begin on Monday morning, which requires that team members travel on Sunday.

A daily management briefing (about 20-30 minutes) conducted by the team leader for a small number of DOE and contractor managers will summarize team observations and coordinate overall team activities. The time, location, and attendance for this briefing should be determined by agreement between local DOE management and the team leader.

Team meetings should last about 1 hour and will focus on issues related to chemical safety vulnerabilities. Each team member should be prepared to discuss relevant observations resulting from the day's activities (e.g., from walkthroughs, interviews, and verifications). Team members should not regard the team meeting as a forum for detailed descriptions of individual activities. A portion of each team meeting will be devoted to development of vulnerabilities from the observations noted and reported by team members.

The coordinator should make arrangements with the site for photographic support to document good visual examples of chemical safety vulnerabilities identified by team members. Team members should direct all requests for photographic support to the coordinator.

After the first round of site visits, team leaders will meet with the Co-Chairmen of the Working Group to discuss lessons learned from their field activities. Changes to the schedule and methodology described in this document will be implemented if necessary.

Attachment 1

LINES OF INQUIRY

Introduction

The lines of inquiry established in this attachment are provided to guide the verification process during site visits conducted by the field verification teams. The lines of inquiry comprise five functional areas and include the following technical disciplines and topics (also see Table 1 below):

- Identification of chemical holdings, including the properties (corrosive, reactive, toxic, carcinogenic, or otherwise hazardous) of chemicals located at the facility.

  Such chemicals may exist in pure form or as mixtures, process intermediates, process byproducts, process wastes, or laboratory wastes. The following issues are of particular importance to the safe maintenance of chemical holdings: (1) proper identification or characterization of types or species and the quantities of each chemical; (2) correct acknowledgement of the properties and hazards associated with these holdings; (3) provision of adequate containers or containment systems, including labeling and storage conditions; and (4) control measures applied to the quality and quantities of chemical holdings.

  The review team's primary concern in this functional area, particularly for those facilities that have ceased to operate or to support chemical operations, is that chemical holdings may never have been adequately controlled or that chemicals have been allowed to accumulate without regard to their potential hazards. Such circumstances may pose substantial risk to workers tasked with D&D of facilities or environmental cleanup.

- Facility physical condition, including the actual fitness or condition of the facility to support its intended chemical mission safely.

  Issues related to the physical facility include (1) mechanical and structural integrity of chemical tankage, vessels, transfer piping, handling equipment, and other types of chemical containment; (2) integrity of secondary or emergency containment (e.g., spill basins and piping encasement) and other engineered barriers; (3) quality and effectiveness of repair maintenance performed on chemical containment; (4) quality and effectiveness of predictive and preventive maintenance on containment; (5) condition and adequacy of safety systems (e.g., fire suppression and ventilation) to protect workers during routine and off-normal operating conditions; and (6) conduct of appropriate hazards analyses and implementation of change control procedures when operations or processes are modified.

- Operational control and management systems, including organizational structure; procedural adherence; maintenance control; access control; engineering and design reviews; configuration control; safe shutdown plans; and site programs for quality assurance, chemical safety, inventory control, transportation and packaging, and corrective actions.

Management systems encompass programmatic activities that relate specifically to protecting the environment and the safety and health of the public and of employees working with, or otherwise being exposed to, hazardous chemicals. Such systems are concerned with the safe performance of all operations activities related to hazardous chemicals. Activities are not limited to ongoing production-related processes and operations; they also include those activities related to chemical handling, transportation, storage, treatment, and disposal that are conducted in inactive, standby, remote, or abandoned facilities. They include both routine work and nonroutine work. The term “nonroutine work” includes “nonoperations work” activities performed by onsite and/or offsite contractors and subcontractors. Types of nonroutine work include maintenance, construction, modification to facilities, cleanup of facilities or processing equipment, waste cleanup, and D&D activities.

- Human resource programs, including training and qualifications, staffing, commitment to chemical safety, personnel performance requirements, and internal communications.

  It is crucial for workers to receive adequate training in both site-specific and facility-specific safety. At a minimum, site-specific safety training should include good chemical work practices that apply equally to all site facilities and should emphasize hazard recognition. Facility-specific safety training should address those operations and processes that are contained within, or are under the control of, a particular facility, including training in the safety practices specific to the facility’s chemical operations and processes and the identification of the specific hazards associated with that facility. Safety training programs should include comprehensive qualification testing to verify that workers have been effectively trained.

  To ensure worker safety, adequate numbers of qualified staff should be provided for chemical operations and processes. Expectations for each worker’s performance in the area of chemical safety should be clearly defined and understood by all concerned parties. All employees should be encouraged to become involved in the development and implementation of chemical safety programs. A program should be in place through which employees can bring their safety concerns to the attention of management.

  Internal formal and informal communication, between workers, supervisors, and managers and with offsite visitors and subcontractors should ensure safety in the workplace and an effective commitment to environmental protection, safety, and health.

- Emergency response program, including (1) response plans for protection of the environment, public safety and health, and worker safety and health in chemical-related emergency scenarios and (2) the physical training and preparation for the execution of those planned responses.

  Emergency planning should be based on specific chemicals maintained in a facility’s holdings and on the associated hazards identified in the technical analyses performed under an effective engineering control program. The emergency response program should maintain the necessary readiness to respond appropriately to any scenario. For the purposes of this evaluation, emergency planning and response should take the following issues into consideration: (1) hazardous chemical releases; (2) inplant consequences; (3) environmental issues; (4) accountability of workers, visitors, and the public; (5) coordination with the surrounding community; and (6) community right-to-know issues.

Questions included under the lines of inquiry have been assigned to the following technical disciplines: management systems (MO), human resources (MT), chemical processes (CP), facility maintenance (FM), industrial hygiene (lH), environmental protection (EN), and emergency preparedness (EP). Each question the lines of inquiry has been coded accordingly.

TABLE 1. MATRIX OF TOPICS FOR THE LINES OF INQUIRY

Functional Area	Lines of Inquiry	Topics
Chemical Holdings	• Inventories • Wastes	• Complete and Documented Inventory • Containment/Storage • Control of Quality/Quantity • Characterization and Control of Waste
Facility Physical Condition	• Structural and Mechanical Integrity	• Containment Systems/Engineered Barriers Integrity • Maintenance Programs * Configuration Management
operational Control and Management Systems	• Management Systems • Operational Controls • Nonroutine Work Controls • Engineering Controls • Packaging and Transportation Controls	• Organizational Structure • Roles and Responsibility • Management Systems • Medical Surveillance • Internal Assessment/Lessons Learned • Procedures for Operation • Procedures for Safe Shutdown • Procedures • Controls • Engineering Analysis * Hazards Analysis . Pre-Start Safety Review • Engineering Safeguards • Onsite Transfers
Human Resources Programs	• Training and Chemical Worker Qualifications • Commitment to Chemical Safety • Personnel Performance • Internal Communications	• Training and Qualifications • Staffing Levels • Employee Involvement “ Employee Concerns Program • Performance Standards • Performance Appraisal • Shift Turnover . Verbal Orders • Documentation
Emergency Response Program	• Emergency Plans • Emergency Response	• Evaluations and Accountability/Procedures • External Communications • Supplies and Equipment “ ERT Training and Availability • Emergency Facilities, Equipment, and Personnel

1.0 Chemical Holdings

1.1 Inventories.

1.1.1 Principal Inquiry: Have all chemicals within a given facility been inventoried and properly characterized, and have the results been formally documented?

(IH) a. Has a comprehensive inventory of all chemicals within the facility (including pure forms, mixtures, intermediates, byproducts, and wastes) been completed? Is this inventory formalized and periodically updated? How is the inventory conducted?

(IH) b. Has a hazards assessment of the chemicals identified by the inventory been performed? If so, has a comprehensive list of hazardous chemicals been developed? Have workers in the facility been notified of the presence of these chemicals? Based on this assessment, have control measures been implemented to restrict access to and protect workers from these hazards?

(IH) c. Are proactive inventory controls used in the facility (e.g., for rotation of stocks and disposal of degraded or aged chemicals?

(IH) d. Have requirements been met for labeling (e.g., for containers, tanks, piping), hazards identification, and warning signs?

(CP) e. Are residual chemicals present in the facility (e.g., in tank heels or other residual chemicals in sink traps and ductwork)? If so, have these been characterized and quantified?

(CP) f. Does the existing or planned chemical inventory pose a Particular threat to the facility or to personel assigned to the facility? Examples include potential quantities of combustible chemicals that, if ignited, could exceed fire protection systems capabilities or potential quantities of carcinogens or toxins that, if released, could exceed safe facility concentration levels or ventilation rates.

1.1.2 Principal Inquiry: Are chemical inventories stored in safe containers (small quantities) or containment (bulk quantities) and arranged in safe and environmentally sound configurations?

(CP) a. Have chemical compatibility and proximity been considered (i.e., with regard to chemical types and quantities)?

(EN) b. Have provisions been made to ensure that drums containing hazardous chemicals are stored in a manner that will prevent or minimize the potential for release of these materials to the environment (e.g., through the collapse of drum stacks, or overheating)?

(IH) c. Do storage cabinets have adequate capacity (volume) and structural capability (shelf loading)? Have the necessary engineering requirements been considered (e.g., access control, tip restraints, fire rating)?

(CP) d. Have the inherent instability of compressed gas cylinders, the potential for container over pressurization, and the location and orientation of large and small containers relative to occupied buildings and work zones been considered?

1.1.3 Principal Inquiry: Are the quality and quantity of each chemical species in the inventory appropriately controlled?

(MO) a. Have controls been established for chemical procurements that emphasize (1) obtaining proper purity and concentration; (2) requiring special notice and approvals for purchase; (3) having appropriate material safety data sheets (MSDS) on file; and (4) requiring conformance to quality assurance and other standards with respect to procurement, receipt, storage, and handling practices?

(MO) b. Are programs in place for the control of chemical inventories to ensure that (1) excessive quantities of hazardous chemicals do not accumulate at a site or within a facility, resulting in increased risk to workers and the environment or to increased consequence of accidents; (2) chemicals that become more hazardous through aging or decomposition are disposed of properly before the "safe storage life" is exceeded; or (3) remote or abandoned facilities are not and do not become storage areas for hazardous or uncharacterized chemicals and chemical wastes?

1.2 Wastes.

1.2.1 Principal Inquiry: **Are hazardous or potentially hazardous wastes characterized to determine constituents? Are these wastes controlled in a manner that minimizes the risk of exposure or injury to workers and the environment?**

(IH) a. Are wastes containing, or thought to contain, hazardous chemicals characterized? If so, are the actual or suspect hazardous wastes controlled in an appropriate manner? Will the systems being used result in a full characterization of the hazardous properties of the waste?

(EN) b. Has the facility implemented procedures for the proper accumulation of wastes? Are procedures available for labeling, drum management, containment, and onsite storage within the allowable accumulation time?

(IH) c. If hazardous chemical wastes are mixed with radioactive wastes (resulting in hazardous mixed wastes), are appropriate precautions taken to protect workers from the effects of the chemicals?

(EN) d. Have all operating exhaust stacks and vents, as well as the sources of fugitive emissions, been inventoried and evaluated to determine which sources require engineering or administrative controls to minimize atmospheric emissions? If needed, have these controls been implemented?

(EN) e. Have all water discharges (e.g., waste, process, sanitary, and storm water) been inventoried and evaluated to determine which sources may require engineering and/or administrative controls to minimize the discharge of contaminants to the environment?

(EN) f. Are routine measurements of both spent "cold" chemicals and mixed wastes performed before disposal? How does the facility conduct hazardous waste determinations?

(EN) g. Has the facility reviewed past chemical operations to determine whether chemical residues remain in areas such as inactive piping, vents, and tanks?

(EN) h. Does the facility have a preparedness and prevention plan to minimize the threat of a hazardous waste release (i.e., separating incompatible wastes)?

2.0 **Facility Physical Condition**

2.1 Structural and Mechanical Integrity.

2.1.1 Principal Inquiry: Is the structural and mechanical integrity of the facility maintained in a condition that is sufficient to prevent the uncontrolled release of hazardous chemicals and to prevent exposure of workers, the public, and the environment to chemicals?

(FM) a. Is the integrity of hazardous chemical containment (e.g., above-ground and underground storage tanks, pressure vessels, and piping) and other engineered barriers properly maintained to ensure that they will perform their intended functions?

(FM) b. Have secondary containment systems for chemical storage areas (i.e., raw material and waste drums, containers, and tanks) been consistently developed, installed, maintained, and inspected?

(FM) c. Are maintenance programs in place to ensure the operability of engineered safety and control systems (e.g., fire protection or building ventilation systems)? If so, do the maintenance programs include the concepts of predictive maintenance, preventive maintenance, and routine periodic surveillance testing of these systems? How does the facility establish preventive maintenance frequencies (e.g., manufacturers' recommendations, past work history)?

(CP) d. From the standpoint of maintaining facility integrity, is a formal engineering analysis or review performed when operations or processes are modified with respect to chemicals, process chemistry, or associated operational parameters or when major repairs are performed on hazardous chemical containment and/or equipment?

(MO) e. When operations or processes are modified, when major repairs are made to hazardous chemical containment and/or equipment, or when modification work is performed on hazardous chemical containment and/or equipment, are the requirements of the configuration management or change control program invoked?

(CP) f. When changes such as those described above are made, are formal hazards analyses performed to verify that the changes are appropriate?

3.0 **Operational Control and Management Systems**

3.1 Management Systems.

3.1.1 Principal Inquiry: Does the organizational structure empower workers to participate in the development and implementation of site ES&H programs?

(MO) a. Does the organizational structure establish a chain of command to identify and empower cognizant individuals to be responsible for developing and implementing site ES&H programs and ES&H programs specific to each facility or operation related to chemical safety?

(MO) b. Does the organizational structure have sufficient flexibility to empower managers and workers alike, in all departments and at all levels, to participate actively in the development and implementation of ES&H programs related to chemical safety?

(MO) c. Have employee roles, responsibilities, and authorities associated with chemical safety been clearly defined? If so, have they been communicated to, and understood by, those employees responsible for carrying out safe chemical practices? Does senior management support and promote safe chemical practices?

3.1.2 Principal Inquiry: Are management systems in place to identify and eliminate or mitigate the effects of chemical hazards?

(MO) a. Are management programs in place to identify all chemical hazards, both general to the site and specific to individual facilities and operations (including waste processing facilities and waste storage facilities, whether they are near other facilities, remote, staffed, or abandoned)?

(MO) b. Are management programs in place to ensure that formal hazards analyses of an appropriate type and complexity are performed for all new and existing processes or operations, including pending waste treatment, waste disposal, or D&D operations?

(MO) c. Are programs in place to eliminate hazardous chemicals through changes in processes or by substituting less hazardous chemicals?

(IH) d. Are safety and health plans in place to ensure that chemical-related safety and health information is maintained current for specific inventories (i.e., type, quantity, physical state, and location) and with respect to the associated hazards and mitigative measures associated with the identified chemicals?

(IH) e. Do the above plans provide for distribution to all employees of safety and health information related to specific hazardous chemicals?

(MT) f. When ES&H-related information for hazardous chemicals is made available to employees, is training provided on retrieving and interpreting that information?

(IH) g. Have programs been implemented effectively to ensure the adequate labeling, hazard warning, and posting of storage vessels, piping, individual containers, and areas of potential release or concentration?

(EN) h. Has the facility implemented programs for safety of operations associated with above-ground and underground storage tanks? Has consideration been given to inventory programs, use of leak monitoring and detection devices, and integrity testing for tanks and piping.

(MO) i. Are controls in place to limit the inventories of hazardous chemicals to quantities that can be handled safely by facility safety systems (e.g., fire suppression and building ventilation systems)?

3.1.3 Principal Inquiry: **Has a** medical surveillance program **been developed and implemented to ensure that workers do not receive excessive exposures to hazardous chemicals?**

(IH) a. Have effective workplace monitoring programs been established at the facility for hazardous and/or toxic chemicals?

(IH) b. Do these programs specifically provide medical surveillance to monitor and control individual worker exposures to all known or suspected chemical hazards?

3.1.4 Principal Inquiry: Are ES&H programs that address hazardous chemicals being continuously improved by analyzing the results of periodic internal assessments and by learning from the experience of other sites or facilities?

(MT) a. Are self-assessments performed to evaluate the effectiveness of ES&H programs? If so, are they performed by managers, workers, or both?

(MT) b. Do self-assessments focus specifically on chemical safety? If so, are they current and accurate? Do they include new chemicals in use and new or revised chemical safety data?

(MT) c. Do self-assessments result in the development of formal reports and specific corrective or mitigative actions for the deficiencies noted?

(MT) d. Do these programs assign corrective actions to responsible individuals, track those actions to completion, and verify their completion or implementation prior to closure?

(MO) e. Are chemical "near-misses," particularly small-scale events, identified and reported ?

(MO) f. Are "lessons learned" (from facility and site experience, from DOE Headquarters, and from other locations) considered when chemical safety programs are modified or improved?

3.2 Operational Controls.

3.2.1 Principal Inquiry: Is all work performed in strict accordance with specific work procedures? Are such procedures based on a technical evaluation of potential hazards associated with the work being performed? Have the procedures been prepared specifically for the task(s) being performed?

(IH) a. Have formal laboratory procedures been developed and implemented for all routine and nonroutine chemical laboratory work? If so, do these procedures incorporate chemical safety considerations. Do these procedures address the need for special safety equipment or laboratory apparatus and for personal protective equipment (PPE)?

(CP) b. Have formal chemical processing procedures been developed and implemented for all routine and nonroutine processes? If so, do these procedures incorporate chemical safety considerations. Do these procedures address operation of the installed safety equipment and the need for PPE?

(MO) c. Do procedures provide the following information: (1) clear instructions for all pertinent activities (e.g., startup, normal and temporary operations, recovery from "off-normal conditions," normal shutdown, emergency operations, emergency shutdown); (2) quantitative definition of the safe limits of operation; (3) safety and health considerations in user-friendly terminology, including the precautions required to prevent exposures and the control measures to be taken in the event of exposure; (4) any special or unique hazards, including precursors of pending off-normal operations; and (5) safety systems and their functions? Are procedures consistent with all process safety information? Are they updated when this information is revised?

(IH) d. Have procedures been developed and implemented for the disposal of unneeded or obsolete chemicals and wastes?

3.2.2 Principal Inquiry: Are specific plans and procedures in place to provide for the safe shutdown of processes and systems involving hazardous chemicals?

(MO) a. Are approved plans and procedures in place describing the safe shutdown of processes and systems involving hazardous chemicals?

(MO) b. Are these plans and procedures modified, as necessary, when changes are made to the process chemistry or to the system hardware?

3.3 **Nonroutine Work Controls.**

3.3.1 Principal Inquiry: Are formal (written and approved) procedures developed for each nonroutine work activity involving hazardous chemical facilities and processes?

(MO) **a.** Do procedures provide the following information: (1) clear instruction for performing the activities; (2) ES&H considerations in user-friendly terminology, including the precautions necessary to prevent personnel and environmental exposures and the control measures to be taken if exposures occur; and (3) information specific to any special or unique hazards?

(IH) b. Have adequate controls been implemented for project activities that could result in personnel and environmental exposures to hazardous chemicals but are not directly related to the operation of hazardous chemical facilities or processes (e.g., maintenance work that might use or be involved with hazardous chemicals)?

(CP) c. Have job safety analyses (JSAS) been performed? Are appropriate considerations given to JSAS in work plans before work begins?

(CP) d. Are JSAS based on normal and potential off-normal scenarios (relative to hazardous chemicals) that might include loss of process control, breach of containment, failure of PPE or safety support systems, or fire and explosion?

(FM) e. Are nonroutine contract workers routinely made aware of identified chemical hazards before each job begins? Do these workers receive adequate training on established work control practices? Are they trained and certified in the proper use of safety equipment, safety systems, and PPE?

(FM) f. When containment must be breached or when engineered safety systems must be bypassed or shutdown during maintenance activities, are appropriate measures taken (e.g., emptying the containment) to prevent the release of hazardous chemicals or to protect the public, workers, and the environment against the effects of chemical release?

3.3.2 Principal Inquiry: Are appropriate controls used to limit exposures or otherwise protect involved workers, noninvolved workers, and the public during nonroutine activities associated with hazardous chemicals?

(MO) a. Are access controls in place for chemical operating areas? If so, do access control criteria take into account the following considerations: (1) cumulative personnel exposures, (2) qualification and training of workers and visitors, and (3) specific chemical procedures and operations that are currently being performed?

(FM) b. Do non routine work procedures include the following: (1) use of approved work permits, (2) requirements for acceptance inspection and post-maintenance testing, and (3) special programmatic requirements for performing work safely?

(IH) c. When infrequently performed routine operations involving hazardous chemicals are assigned to facility workers, are the elements of a nonroutine work control program invoked? (Note: This question is oriented toward infrequently performed routine operations for which engineered safeguards do not exist or where existing administrative controls cannot be invoked, thus a JSA must be applied.) If so, do these elements specifically identify the hazards that might be encountered and special protective measures that should be taken?

(FM) d. Does the nonroutine work control program (e.g., for nonroutine work authorization or hot-work permit) clearly define all preventive or mitigative measures to be taken, including (1) necessary communications with operations personnel, (2) access control and personnel accountability (e.g., confined-space entry), (3) mechanical or electrical isolation (e.g., Iockout/tagout), (4) emergency contacts for off-normal occurrences or accidents, and (5) appropriate safety equipment and **PPE** to be available for direct or indirect use?

(FM) e. Are nonprocess-related safety systems and equipment (including breathing-air supplies, fire and smoke detection and alarms, fire suppression, chemical surveillance, and PPE) provided and maintained for the protection of workers?

(FM) f. When both routine and nonroutine work are being performed within, or in the vicinity of, a hazardous chemical facility or when there are colocafed workers, offsite subcontractors, or visitors present while hazardous chemical work is being performed, are integrated work control policies or programs in effect to identify and protect all workers and visitors? Do these policies or programs include such elements as access control, job-hazard analysis, special procedures, training, the use of PPE, and the provision of sufficient ES&H oversight?

3.4 Engineering Controls.

3.4.1 Principal Inquiry: Are formal engineering analyses performed for all new or modified hazardous chemical operations or processes?

(CP) a. Is all engineering work relative to the control or containment of hazardous chemicals performed by or under the direction of a trained and qualified **engineering staff?**

(CP) **b.** Are engineering analyses formally documented (i.e., written format and including all assumptions, hypotheses, references, numerical calculations, design "answers" or conclusions, and reviews and approvals, as applicable)?

(CP) c. Are specific engineering analyses performed for new processes or modifications to existing processes, including new processes for waste treatment and D&D?

(CP) **d.** Do engineering analyses address such topics as reaction kinetics, critical limits of operation (e.g., temperature, pressure, and mass quantities), partial or unexpected reactions and associated chemical intermediates or byproducts, consequence of unplanned emergency operation or process shutdown, and so forth? If so, do the results of these analyses become the bases of design or selection of equipment and hardware, or of process controls and safeguards? Are they used to determine the suitability of the facility (or its supporting safety systems) to the chemical operation or process?

(EN) e. Has the facility implemented investigative actions to determine whether surface and subsurface conditions (e.g., groundwater, surface water, soil, sediment, and biota) have been affected by the storage of hazardous waste or chemicals?

(CP) f. Are containers, tanks, pipes, and other primary containment for highly hazardous and toxic chemicals specifically engineered to be highly reliable (e.g., corrosion-resistant materials, appropriate corrosion allowances, and conservative support systems) ?

(CP) g. Does the design process recognize storage temperature limitations, pressure limitations, and so forth? Does the process include contingencies for exceeding those limits?

(EN) h. Has the facility considered the following issues during the design and installation of above-ground chemical storage tanks: spacing between tanks, tank venting, tank support and anchorage, and material transfer secondary containment features (e.g., spill trays for small quantities, lined basins for bulk quantities, and encased piping for process or transfer systems)?

(MO) i. Is a program in place for formal review and approval of engineering designs or analyses by the responsible ES&H organizations? When particularly crucial or hazardous operations or processes are involved, are these documents reviewed and approved by independent technical experts who were not associated with or responsible for the work?

(EN) j. Has the facility developed and implemented effective construction and operation systems for the management of chemical materials in underground storage tanks? (Consideration should be given to spill and overfill controls, corrosion protection systems, release detection systems, and corrective action measures associated with chemical releases to the environment.)

3.4.2 **Principal Inquiry: Are formal hazards analyses performed for all hazardous chemical operations and processes?**

(CP) a. Are programs in place to require a formal (i.e., documented) hazards analysis of appropriate type and complexity for each new or existing process and operation? If so, do these analyses typically identify and evaluate the hazards involved? Are appropriate measures implemented to control the hazards? (Note that such analyses are necessarily a part of the formal safety analysis report, or SAR, that is required for all facilities.)

(CP) b. Do hazards analyses consider all normal, off-normal, and accident-related scenarios that could expose the public or workers to hazardous chemicals?

(CP) co Are accident or event scenarios that could result in acute or chronic effects to workers, the public, or the environment (but are less significant or less catastrophic than SAR-related scenarios) included in these analyses?

(CP) d. If hazardous chemicals are a prime consideration in the facility safety envelope, do SAR analyses match the types and quantities of chemicals being used and stored in the facility?

(MO) e. Are hazards analyses formally documented, reviewed, and approved in the same manner as engineering analyses?

3.4.3 **Principal Inquiry: Are prestart safety reviews performed before startup of new or modified chemical processes or operations? Is change control and configuration management an element of engineering programs to ensure that all engineering changes are documented once successful startup has been accomplished?**

(MO) a. Are prestart safety reviews of hazardous chemical process and process-related systems performed to ensure that the mandatory portions of Federal regulations and standards have been met? Are nonmandatory engineered safeguards and systems identified as having a preventive or mitigative function in the hazards analysis included, and are they fully operational?

(MO) b. Are quality assurance or change control programs implemented to manage and control changes to new or existing engineering designs?

3.4.4 **Principal Inquiry: Are specific engineering safeguards included in designs and modifications to ensure that hazardous chemical operations and processes are intrinsically safe?**

(FM) a. Is adequate industrial ventilation provided for storage and operating areas? If so, have hazardous chemical exposure limits, airborne chemical concentrations, samplers, detectors, alarms, explosive limits, and compatibility of vapors been considered?

(FM) b. Have inert gas systems (e.g., blanketing or fire suppression) been engineered with due consideration for risk assessment, confined-space entry, line rupture, suffocation, and so forth?

(FM) c. Has the need for piping identification and the potential for disconnection to hazardous or toxic chemical lines been considered in engineering designs (e.g., fittings, backflow prevention)?

(FM) d. Have compressed gas systems been specifically engineered with consideration for the stability of containers, the potential for overpressurization, and the location and orientation of containers relative to occupied buildings or work zones?

(FM) e. Have pressure relief systems for chemical containment been specifically engineered for their application? If so, have provisions been made for scrubbing or treatment of vent gases or containment of vent gases in confined spaces?

(FM) f. Has appropriate consideration been given to above-ground and underground hazardous chemical storage tanks to ensure that any release of these chemicals to the environment is minimized (e.g., leak detection, cathodic protection, or vent scrubbers)?

(FM) g. Are the inventories (chemical species and quantity) of combustible chemicals within the facility reviewed regularly to ensure that existing fire suppression systems are of adequate capacity? Are the installed fire suppression systems compatible with all chemicals present (e.g., a water suppression system in a sodium process room versus a dry chemical or Halon system)?

3.5 **Packaging and Transportation Controls.**

3.5.1 Principle Inquiry: Are onsite transfers of hazardous chemicals conducted in a safe manner?

(FM) a. Are approved procedures in place to define safe packaging and transportation requirements for onsite transfer or en route transit storage of hazardous chemicals?

(MT) b. Have personnel who are responsible for handling, packaging, storing, or onsite transfer of hazardous chemicals been properly trained for their assigned duties?

(FM) c. Have personnel who are involved in the handling, packaging, storing, or onsite transfer of hazardous chemicals been property trained to handle these materials during incidents or off-normal events?

4.0 **Human Resource Programs**

4.1 Training and Chemical Worker Qualifications.

4.1.1 Principal Inquiry: Have workers involved in hazardous chemical operations and processes received specific training in the tasks and procedures for which they are responsible? Have they demonstrated their qualifications to perform work safely? Has the facility conducted an assessment to determine the types, amounts, and requirements for training personnel to manage chemicals?

(MT) a. Do all employees (including full-time, intermittent and temporary workers, supervisors, and managers who are responsible for operations or who provide guidance and interpretation of procedures) receive laboratory-specific or process-specific training related to chemical safety?

(MT) b. Does this training program include hazardous materials (HAZMAT) training for all employees who work in chemical zones?

(MT) c. Are comprehensive indoctrination and generic training relative to chemical hazards provided to new employees before they are assigned to perform work involving hazardous chemicals?

(MT) d. Is refresher training provided to all employees assigned to hazardous chemical duties, as defined above, at intervals of at least every 3 years or on an as-needed basis?

(MT) e. Is orientation training provided for subcontractors and visitors before they are allowed to enter areas of the facility where chemical hazards may exist?

(MT) f. Does the training of personnel involved with hazardous chemicals result in an understanding of any of the following: (1) hazards associated with chemicals used in or resulting from a specific procedure or process; (2) procedures used to perform laboratory activities or operate processes safely; (3) safe limits of operation; (4) precursors or physical indicators of pending unsafe “procedures” or process operating conditions; (5) appropriate actions to be taken in response to process upset or emergency process conditions; (6) opportunities available for employees to contribute to process safety improvement; and (7) SARA Title Ill requirements for community right-to-know?

4.1.2 Principal Inquiry: Are staffing levels adequate to ensure that employees assigned to chemical-related operations and processes are able to conduct their work safely?

(MT) a. Are staffing levels sufficient to ensure that workers who perform hazardous-chemical-related operations and processes do not receive excessive chemical exposures (e.g., one-time or time-weighted average), are not required to work overly long hours, or do not circumvent established safe work practices and procedures?

(MT) b. Are staffing levels sufficient to permit use of the “buddy” system for hazardous chemical operations involving a significant degree of risk to workers, the public, or the environment?

(MT) c. Is a sufficient support staff of qualified ES&H professionals provided to oversee routine and nonroutine activities involving hazardous chemicals?

(MT) d. Are management plans in place to define required staffing levels and the appropriate mix of training and skills required to conduct safe operations involving hazardous chemicals? If so, are staffing levels in these plans based on JSAS specific to the tasks being performed?

4.2 **Commitment to Chemical Safety.**

4.2.1 Principal Inquiry: Does the site safety culture clearly demonstrate recognition of and respect for the inherent dangers of hazardous chemical operations and processes?

(MT) a. Is an employee concerns program in place to encourage workers to report unsafe conditions or practices related to hazardous chemicals?

(MT) b. Do workers and supervisors know how to report unsafe conditions or practices associated with hazardous chemicals? If so, do workers feel inhibited about using the reporting process?

(MT) c. Are documented safety concerns (e.g., from the employee concerns program) promptly addressed by management?

(MT) d. Are documented safety concerns analyzed for trends and root causes and used by management to correct chemical safety deficiencies?

(MT) e. Is employee involvement (e.g., participation in process-hazards analysis) solicited by management for matters related to chemical safety?

(MT) f. Do workers have stop-work authority? If so, do they understand the limits of that authority? Would they feel free to exercise that authority if they observe unsafe conditions or practices?

4.3 Personnel Performance.

4.3.1 Principal Inquiry: Are personnel responsible for handling, processing, or storing hazardous chemicals or hazardous waste performing their assigned duties safely?

(MO) a. Are chemical safety performance standards and expectations clearly stated to all employees involved in handling, processing, or storing hazardous chemicals and wastes?

(MO) b. Is an effective performance appraisal program in place to hold employees accountable for chemical safety performance?

4.4 Internal Communications.

4.4.1 Principal Inquiry: Are internal communications sufficiently effective to prevent situations that could lead to serious chemical-related accidents or injuries or releases to the environment?

(MO) a. Are routine communications thorough (e.g., verbal orders, shift turnover)? Do they place appropriate emphasis on worker safety and health and the environment as these issues relate to hazardous chemical operations and processes?

(MO) b. Is a sufficient support staff of qualified ES&H professionals provided to evaluate situations and conditions, to advise supervisors and workers of potential hazards, and to oversee hazardous chemical activities?

5.0 **Emergency Response Program**

5.1 Emergency Plans.

5.1.1 Principal Inquiry: Are sitewide emergency plans in place to protect workers, the public, and the environment in the event of a major chemical-related accident?

(EP) a. Has a sitewide emergency plan been developed to direct all necessary activities to protect workers and the public? If so, are site emergency plans based on an evaluation of real conditions and potential hazards, including hazardous chemical inventories and associated accident scenarios identified in the formal hazards analyses?

(EP) b. Do site emergency plans address catastrophic accidents and events **as well as** less significant accidents and events that may include limited exposures, spills, and unexpected chemical reactions?

(EP) c. Does each individual facility involved with the handling, storage, use, or disposal of hazardous chemicals have a facility-specific emergency plan that is based on an evaluation of real and potential hazards, including hazardous chemical inventories and associated accident scenarios identified by formal hazards analyses?

(EP) d. Has an emergency plan been prepared describing actions that should be taken by facility personnel in response to sudden or nonsudden releases of hazardous chemicals or hazardous waste to air, soil, or surface water?

(EP) e. Are employees trained in their respective duties and responsibilities as set forth in the site and facility emergency plans? Is training reinforced by periodic drills?

5.1.2 **Principal Inquiry: In the event of a major chemical-related accident, do emergency plans address the evacuation of and accountability for workers and members of the public who may be in close proximity to the site or facility?**

(EP) a. Do site or facility emergency plans provide for the notification and evacuation of plant personnel? Likewise, do these plans provide for accountability of plant (site or facility) personnel after the evacuation?

(EP) b. Do the site or facility evacuation plans provide for the notification and controlled evacuation of the public from high-risk areas that are adjacent to the site (i.e., during catastrophic events)? Have these plans been coordinated with local communities?

(EP) c. Has a life-safety disaster or warning system (site and public, as applicable) been installed at the site or facility? If so, is the system maintained and tested regulary?

(EP) d. Do site emergency plans provide for the notification of offsite authorities and emergency response teams (e.g., HAZMAT, medical, fire, environmental, security)? If so, are interface agreements (memorandums of understanding, or MOUS) in place with such agencies? Have meetings been held with the local community to plan for catastrophic releases? Has the site conducted modeling to identify the receptors of and potential impacts from chemical releases?

(EP) e. Is the plant medical staff alerted to and kept up-to-date about chemical hazards?

(EP) f. Has a contact list been prepared to identify outside organizations, including the DOE emergency operations center (EOC), in the event of a large chemical emergency?

5.1.3 Principal Inquiry: Are appropriate supplies and equipment maintained at the site or facility to provide for the effective mitigation of the effects of hazardous chemical accidents?

(EP) a. Are safety showers, eyewash stations (with appropriate freeze protection, flow alarms, flow capacity, and temperature control), and other installed safety equipment provided, properly maintained, and periodically inspected?

(EP) b. Is the control of PPE, including chemical decontamination and repair, appropriate and effective? Are sufficient quantities and types of PPE available to respond to the identified emergencies?

5.2 Emergency Response.

5.2.1 Principal Inquiry: Is an emergency response team (ERT) trained and available at the site to respond to, monitor, and control the effects of hazardous chemical accidents and events?

(EP) a. Is an onsite ERT maintained to respond to chemical accidents and emergencies? Are specific procedures developed to ensure team effectiveness. Are the members trained and qualified to those procedures?

(EP) b. Are the above procedures and training based on potential hazards, including the hazardous chemical inventories and associated accident scenarios identified in the formal hazards analyses?

(EP) c, Are adequate supplies of PPE maintained for emergency response, and are ERT members trained in its use? Is this emergency PPE specifically selected for the chemical hazards represented by current inventories?

(EP) d. Are emergency materials and supplies (including reagents for treatment of personnel after exposures, engineered emergency barriers, containment, and spill control kits) provided for the potential chemical hazards?

(EP) e. After emergency conditions have stabilized, is a formal accident investigation or critique of events typically performed? If so, does this effort include (1) identification of root and contributing causes, (2) evaluation of historical events related to the accident, (3) dissemination of the lessons learned, and (4) definition of corrective actions to be taken to prevent future accidents?

5.2.2 **Principal Inquiry: Can emergency facilities, equipment, and personnel support site and facility emergency operations involving hazardous chemicals?**

(EP) a. Are emergency facilities (including an EOC) adequately sized, equipped, and maintained to support emergency responses to chemical-related incidents?

(EP) b. Are drills involving chemical hazards scheduled and conducted to develop and maintain the knowledge and skills of emergency personnel and to confirm the adequacy and readiness of emergency facilities and equipment?

(EP) c. Do these drills involve crucial onsite and offsite support functions, such as fire protection, personnel and environmental monitoring, and spill control? If so, do these drills confirm the readiness of the site and the supporting public agencies to respond to chemical-related emergencies?

(EN) d. Has the facility adequately identified the hazards associated with the release of hazardous materials and wastes? Are the hazardous properties of the chemicals known, individually and collectively? Is the emergency response document comprehensive in nature?

References

29 CFR 1910.119	Process Safety Management of Highly Hazardous Chemicals (6-l-92)
29 CFR 1910.120	Hazardous Waste Operations and Emergency Response
29 CFR 1910.1200	Hazard Communication (9-23-87)
29 CFR 1910.1450	Occupational Exposures to Hazardous Chemicals in Laboratories (5-1-90)
DOE 5480.4	Environmental Protection, Safety, and Health Protection Standards (5-1 5-84)
DOE 5480.23	Nuclear Safety Analysis Reports (4-30-92)
DOE 5481.1 B	Safety Analysis and Review System (9-23-86)
DOE 5483.1 A	Occupational Safety and Health Program for DOE Contractor Employees at Government-Owned Contractor-Operated Facilities (6-22-83)
DOE 6430.1 A	General Design Criteria (4-6-89)

Attachment 2

MATRIX OF TEAM MEMBERS' AREAS OF RESPONSIBILITY

Functional Area	Team Member Area of Responsibility y	Functional Area Attributes
Identification of Chemical Holdings	• Industrial Hygiene • Chemical Processes Safety • Environment	• Chemical Systems • Safety Systems • Chemical Storage • Properties of Chemicals • Inventory Analysis • Chemical Characterization • Inventory Control
Facility Physical Condition	• Maintenance	• Engineered Barriers • Maintenance Programs • Safety Systems • Configuration Control
Operational Control and Management Systems	. Management and Operations • Industrial Hygiene • Emergency Preparedness • Management and Training	• Procedural Adherence • Design Review • Hazard Analysis • Quality Assurance Program • Engineered Barriers • Safety Systems • Configuration Control • Transportation and Packaging • Corrective Actions • Personnel Monitoring
Human Resource Programs	• Management and Training . Management and Operations	• Training and Qualifications • Staffing • Visitor and Subcontractor Control
Emergency Response Program	Ž Emergency Preparedness • Environment	• Community Right-To-Know • Emergency Plan • Environmental Issues • Inplant Consequences
Team Management	. Team Leader	• Control of Team Activities • Communication with M&O and DOE Management
Field Verification Report	• Team Leader • Technical Editor	• Technical and Factual Accuracy • Clarity and Style
Report Preparation	• Coordinator	• Clerical Support • Printing • Schedules • Document Cent rot

Team Members: Team Leader (1), Industrial Hygiene (1), Chemical Process (1), Maintenance (1), Management/Operations (1), Management/training (l), Emergency Preparedness (1), Environmental Protection (1), Coordinator (l), Technical Editor(1), and Site Liaison (1),

ATTACHMENT 3

FIELD VERIFICATION FORMS

Standard forms (formats) have been developed for recording observations and vulnerabilities. These forms will be available to team members in electronic as well as hard-copy versions.

CHEMICAL SAFETY VULNERABILITY REVIEW
OBSERVATION FORM

DATE:

Site/Facility:

Team Member:

Observation Number:

Functional Area(s):

1. Identification, (Provide Brief Description.)

2. Basis. (Provide all necessary information leading to identification of the observation, including applicable codes and standards.)

(Team Member, Date)

CHEMICAL SAFETY VULNERABILITY REVIEW
VULNERABILITY FORM DATE:

Site/Facility:

Lead Team Member:

Vulnerability Number:

Functional Area(s):

1. Brief Description of Vulnerability. (Use 1-10 words.)

2. Summary of Vulnerability. (Use 1-3 sentences.)

3. Basis. (Provide all necessary information leading to identification of the observation, including applicable codes and standards.)

a. Requirements:

b, Chemicals Involved:

c, Relevant Self-Evaluation Data:

d. Contributing Causes:

e. Potential Consequences:

CHEMICAL SAFETY VULNERABILITY REVIEW
VULNERABILITY FORM **DATE:**

Site/Facility:

Lead Team Member:

Vulnerability Number:

Functional Area(s):

4. Supporting Observations.

(Team Leader, Date)

ATTACHMENT 4

FIELD VERIFICATION REPORT FORMAT

Executive Summary (about 1 page)

1.0 Introduction

1.1 Purpose and Scope (about ½ page)

1.2 Site Description (about ½ page)

1.3 Facilities Visited (1 paragraph per facility)

2.0 Summary of Results (includes addressing the verification of data)

2.1 Identification of Chemical Holdings (about 1 page)

2.2 Facility Physical Condition (about 1 page)

2.3 Operational Control and Management Systems (about 1 page)

2.4 Human Resource Programs (about 1 page)

2.5 Emergency Response Programs (about 1 page)

3.0 Categorization and Prioritization of Vulnerabilities

3.1 Criteria (about ½ page)

3.2 Discussion of Facility-Specific Vulnerabilities (1 -2 pages)

Appendixes:

A. Team Composition
B. Team Bios
C. List of Documents
D. List of Contacts
E. Vulnerability Forms
F. Selected Acronyms

Attachment 5

TECHNICAL REPORT STYLE

Writing style is the cumulative effect of the writer's choice of words and phrases, sentence structure, emphasis, and arrangement of material. In technical writing, an effective writing style will not intrude on the communication of facts, rather it will provide a basis for transmitting information clearly and concisely. Good technical writing is not apparent until it falters. Inconsistent or inappropriate wording, sentence structure, or punctuation distracts the reader and distorts meaning. For more detailed guidance related to style, ask the team editor for a copy of EH-30 Instruction 30.40.03, "Style Guide for the Office of Performance Assessment," dated December 17, 1993.

Plain English

Use "plain English," not bureaucratic and technical jargon, for all technical communications. The use of plain English in Government documents is official policy.

In keeping with this guidance, use familiar words. Concise and clear writing increases reading speed and comprehension. Make writing readable and understandable by using familiar words. Such words tend to be short and are often used in conversation.

Less Familiar	Familiar
utilize, employ	use
accumulation	buildup
prior to	before
proceed	go on, go
facilitate	permit, ease
in addition	too, also
following	after

Use "active" verb forms and select "strong" verbs instead of "long" verbs.

Long	(Short) Strong
accomplish	do, finish
fabricate	make
perform	do, make
prevent from	keep from

Avoid disguising a strong, active verb as a noun that functions as the object of a weak verb.

Hidden Action Verb	Strong
make an inspection	inspect
perform a verification	verify
take the measurement	measure

Use words and phrases with precise meanings. Words and phrases that do not have precise meanings should be avoided. "Subjective" adjectives, adverbs, and phrases make the reader interpret (in his or her own judgment) the depth, degree, importance, or seriousness of the item being presented.

Examples: very, immediately, significant, as soon as possible, adequate

Sentence Structure

Arrange words into sentences and sentences into paragraphs so that the meaning is clear on first reading. Build concise sentences. Economy in writing is achieved by omitting needless words and phrases and by phrasing information succinctly.

Acronyms

Minimize the use of acronyms and abbreviations.

- Define each acronym at its point of introduction in the report. Avoid improvising your own acronyms.

- Do not use the apostrophe with plural acronyms or dates (e.g., ORRS, 1990s).

References

Identify all documents reviewed during the evaluation or referenced in the report.

- Maintain a list of all documents reviewed. A comprehensive document list will be included as an appendix to the report.

- List each documents by its number, title, revision number, and date. Example: DOE/EH-0282, Task Group Report to the Assistant Secretary for Environment, Safety and Health on Oversight of Chemical Safety at the Department of Energy, dated November 1992. Accurate and complete information is essential.

- Underline or italicize the titles of manuals and published reports (Example: DOE-X2X, Environment, Safety, and Health Manual, January 1993). The titles of procedures and similar documents are put in quotation marks (Example: SOP 1.10-6, "Safety and Health Training Requirements for Visitors," January 23, 1994).

Numbers

Spell out the numbers "one" through "nine" unless a specific numerical value is being cited. Use numerals for 10 and higher. Use commas for four-digit numerals, 1,000 or greater. Note that units of time and measurement are always expressed in numerals (e.g., 2 years, 6 feet).

ATTACHMENT 6

DAILY SCHEDULE

Day 1 (Mon.)

8:30 a.m.	Badging, orientation, and site training for team members.
10:30 a.m.	Team leader briefs site management on verification visit objectives and activities. Site briefs team on self-evaluation (including information on facilities reviewed).
11:55 a.m.	Team member introductions to site counterparts.
p.m.	Team members conduct interviews, walkthroughs, and verifications with counterparts.
5:00 p.m.	Team meeting. Team members brief team leader on individual review plans and any initial observations. Team members provide updated schedules through Wednesday to coordinator.

Day 2 (Tues.)

8:00 a.m.	Team leader meets with site management. Editor assembles and edits Team Composition (Appendix A) and Team Biographical Sketches (Appendix B).
8:30 a.m.	Initial observation forms based on reviews of field self-evaluation data and first-day activities due from team members to coordinator. Coordinator provides copies to team leader and editor.
a.m./p.m.	Team members conduct interviews, walkthroughs, and verifications with counterparts.
5:00 p.m.	Team meeting to discuss observations. Updated schedules through Thursday due to coordinator. Team members provide editor with initial document and contact lists to be included in Appendixes C and D.

Day **3** (Weds.)

8:00 a.m.	Team leader meets with site management. Editor completes Team Composition and Team Biographical Sketches and begins to assemble Criteria (Section 3.1), List of Documents (Appendix C), List of Contacts (Appendix D) and Selected Acronyms (Appendix F).
8:30 a.m.	Team member observation forms due to coordinator. Coordinator provides copies to team leader and editor.

Day 3 (Weds.)

a.m./p.m.	Team members conduct interviews, walkthroughs, and verifications with counterparts.
5:00 p.m.	Team meeting to discuss observations. Updated schedules through Friday due to coordinator. Team members provide editor with updates to document and contact lists for Appendixes C and D.

Day 4 (Thurs.)

8:00 a.m.	Team leader meets with site management.
8:30 a.m.	Team member observation forms due to coordinator. Coordinator provides copies to team leader and editor.
a.m./p.m.	Team members conduct interviews, walkthroughs, and verifications with counterparts.
5:00 p.m.	Team meeting to discuss observations. Updated schedules through Friday due to coordinator (team members should identify their requirements for administrative support over the weekend). Team members receive assignments for drafting sections of field verification report from team leader. Team members provide editor with updates to document and contact lists for Appendixes C and D.

Day 5 (Fri.)

8:00 a.m.	Team leader meets with site management.
8:30 a.m.	Team member observation forms due to coordinator. Coordinator provides copies to team leader and editor.
a.m./p.m.	Team members conduct interviews, walkthroughs, and verifications with counterparts.
3:30 p.m.	Final observation forms due from team members to coordinator. This is the deadline for any new observation forms. Coordinator provides copies to team leader and editor.
4:00 p.m.	Team meeting to categorize facility-specific vulnerabilities based on the observation forms that have been submitted throughout the week, Team members receive assignments for drafting vulnerability forms from team leader. Team members provide editor with updates to document and contact lists for Appendixes C and D.

Day 6 (Sat.)

a.m.	Team members work independently as required to complete first draft of assigned field verification report sections and vulnerability forms.
3:00 p.m.	First draft of assigned field verification report sections and vulnerability forms due from team members to coordinator. Coordinator provides copies to team leader and editor.
p.m.	Editor provides feedback to team members.

Day 7 (Sun.)

a.m.	Team members work independently as required to complete second draft of assigned field verification report sections and vulnerability forms based on feedback from team leader and editor.
12:30 p.m.	Second draft of field verification report sections and vulnerability forms due to coordinator.
1:30 p.m.	Coordinator provides copies of all draft field verification report sections and vulnerability forms to team members. Team members prepare for peer review.
3:00 p.m.	Team meeting to conduct peer review of second draft of field verification report and vulnerability forms.

Day 8 (Mon.)

8:00 a.m.	Team leader meets with site management.
9:00 a.m.	Third draft of assigned field verification report sections and vulnerability forms due from team members to coordinator. (A disk with this information should also be turned over for further control by the team leader and editor.)
a.m./p.m.	Team members should conduct followthrough work to verify any questionable information.
2:00 p.m.	Team meeting to review and prioritize identified facility-specific chemical safety vulnerabilities.

Day 9 (Tues.)

8:00 a.m.	Team leader meets with site management. Coordinator makes controlled copies of draft field verification report available for site factual accuracy review.

Day 9 (Tues.)

9:00 a.m.	Team leader develops slide presentation for outbrief.
noon	Team members meet with site counterparts to discuss factual accuracy issues.
2:00 p.m.	Meeting between site representatives and team to review factual accuracy changes as a result of meeting with counterparts and to resolve any remaining issues.
4:00 p.m.	Team members work with team leader and editor to ensure that changes made to field verification report as a result of the factual accuracy review are properly incorporated. Editor submits final changes to coordinator for correction and final draft preparation.

Day 10 (Weds.)

8:30 a.m.	Editor and coordinator perform final quality check of draft field verification report before reproduction.
10:00 a.m.	Team leader conducts outbrief with site management and delivers copy of final draft of field verification report. Team members should be prepared to answer detailed questions.
10:45 a.m.	All team members leave the site,

APPENDIX D

FIELD VERIFICATION REPORT
LAWRENCE LIVERMORE NATIONAL LABORATORY
APRIL 18-26, 1994

CONTENTS

ATTACHMENTS

EXECUTIVE SUMMARY

This report presents the results of the field verification review conducted at Lawrence Livermore National Laboratory (LLNL) from April 18 to April 26, 1994. The LLNL review was part of the Chemical Safety Vulnerability Review being conducted by the Department of Energy's Office of Environment, Safety and Health at the direction of the Secretary of Energy. The purpose of the review is to identify and characterize conditions or circumstances involving potentially hazardous chemicals at DOE facilities. Specifically, the review is designed to identify, characterize, and prioritize chemical safety vulnerabilities that might result in (1) fires or explosions from uncontrolled chemical reactions, (2) exposure of workers or the public to chemicals, or (3) releases of chemicals to the environment.

Ongoing activities at LLNL include the varied use, handling, transportation, storage, and disposal of hazardous chemicals primarily related to laboratory processes. During the field verification review, team members reviewed those facilities included in the LLNL self-evaluation effort (i.e., the B-222-229 Complex, B-235, and the B-825-827 Complex). In addition, B-1 53, B-322, and the City of Livermore Fire Station No, 2 were visited by the review team.

As a result of the LLNL field verification activities, four chemical vulnerabilities were identified: (1) limited strategic planning for the disposition of aging/inactive facilities that may contain residual amounts of hazardous or mixed waste, (2) weaknesses in the hazards analysis program, (3) the absence of Emergency Plan Implementing Procedures for integrated LLNL response to a sitewide hazardous materials emergency, and (4) personnel entry into potentially hazardous work environments without benefit of chemical safety training. The vulnerability pertaining to disposition of aging/inactive facilities that may contain residual amounts of hazardous or mixed waste is identified as both an LLNL site-specific vulnerability and a potential DOE-wide generic chemical vulnerability. This vulnerability is related to the problematic issue of aging, deteriorating buildings identified in the LLNL self-evaluation. The vulnerabilities pertaining to hazards analysis, emergency response, and implementation of chemical safety training are identified as site-specific vulnerabilities associated with sitewide LLNL programs, These vulnerabilities are related to the management prioritization and resource allocation concerns identified in the LLNL self-evaluation. None of the identified vulnerabilities represents a condition or circumstance with severe potential consequences in the near term.

Field verification activities also identified the following commendable practices pertaining to chemical safety at LLNL: (1) use of a dedicated hazardous waste management technician to manage wastes generated by Chemistry and Materials Science Directorate researchers, (2) development of a system to calculate and classify air emissions to facilitate compliance with California air regulations, (3) development and implementation of a Laboratory-wide form to enhance the identification of potential hazards in the workplace, (4) formation by maintenance personnel of an independent safety committee to promote safe work practices, (5) development and (future) implementation of the ChemTrack and Facility Management Information Systems to provide information on chemical inventories, (6) provision of support to the Albuquerque Operations Office Toxic Materials Coordinating Committee, and (7) coordination of emergency response between the LLNL Fire Department and the fire departments of surrounding communities.

The vulnerabilities identified at LLNL, along with those identified at other DOE sites during the field verification phase of the Chemical Safety Vulnerability Review, will be evaluated to determine DOE-wide generic vulnerabilities. Site-specific vulnerabilities are being made available to the sites for use in developing management response plans, which in turn will provide input for the DOE-wide management response plan.

1.0 INTRODUCTION

1.1 Purpose and Scope

Based on direction from the Secretary of Energy, the Assistant Secretary for Environment, Safety and Health established the Chemical Safety Vulnerability Working Group to review and identify chemical safety vulnerabilities within the Department of Energy (DOE). The Office of Environment, Safety and Health was designated to lead the review, with full participation from DOE line organizations having operational responsibilities. The information obtained from the review will provide the Working Group with valuable input for determining generic chemical safety vulnerabilities that face the DOE complex. Identifying and prioritizing generic chemical safety vulnerabilities will enhance the Department's focus on programs, funding, and policy decisions related to chemical safety.

The Chemical Safety Vulnerability Review was designed and undertaken to identify and characterize adverse conditions and circumstances involving potentially hazardous chemicals at facilities owned or operated by the Department. Specifically, the review was designed to identify, characterize, and prioritize chemical safety vulnerabilities associated with conditions or circumstances that might result in (1) fires or explosions from uncontrolled chemical reactions, (2) exposure of workers or the public to hazardous chemicals, or (3) release of hazardous chemicals to the environment. Using input from line organizations with operational responsibilities, to guide the review, the Working Group developed a project plan[i] to guide the review.

This report documents activities related to the field verification phase of the Chemical Safety Vulnerability Review. The field verification process was designed to use independent teams of technical professionals with experience in a variety of environment, safety, and health (ES&H) disciplines to verify the accuracy and completeness of the data compiled during the field self-evaluation phase of the review. The field self-evaluation phase of the review used a standardized question set developed and distributed by the Working Group to collect data related to chemical safety from 84 facilities located at 29 sites. Based on review of this input, nine sites, including Lawrence Livermore National Laboratory (LLNL), were chosen to participate in the field verification phase of the review.

The review considered a broad range of facilities at LLNL (based on facility type and operational status), with special attention given to those facilities being transferred to, awaiting, or undergoing decontamination and decommissioning (D&D). Different types of chemical- and waste-handling facilities, including laboratories, process facilities, and waste treatment and storage facilities, were examined during the review to permit identification of vulnerabilities arising from hazardous chemicals and wastes at LLNL.

The LLNL field verification team, under the direction of a DOE team leader, was composed of DOE staff and contractor personnel with technical expertise in various aspects of chemical safety, including management, operations, training, chemical process safety, industrial

---

[i] "Project Plan for the Chemical Safety Vulnerability Review," dated March 14, 1994.

hygiene, maintenance, environmental protection, and emergency preparedness. A team composition list is provided in Attachment 1 of this appendix.

The team met with management or technical representatives from each of the facilities reviewed. Individual and small group meetings were also held, and team members conducted facility walkthroughs, document reviews, and personnel interviews to gather information related to potential chemical safety vulnerabilities at LLNL. The team leader met daily with management personnel to discuss the team's activities and any issues that may have surfaced during the previous day. Before the field verification team left the LLNL site, management from local DOE and contractor organizations conducted a factual accuracy review of the draft document. An outbriefing was conducted for DOE and contractor management on Tuesday, April 26, 1994. A draft copy of this report was provided to DOE and contractor management.

1.2 Site Description

LLNL is located on an 821-acre site at the eastern end of Livermore Valley in southeastern Alameda County, California, about 50 miles southeast of San Francisco. Figure 1 shows the regional location of LLN L. The Livermore Valley is the eastern part of a valley system lying south of Mt. Diablo and east of the hills surrounding San Francisco Bay. Farther to the east, another low range of hills separates the Livermore Valley from the San Joaquin Valley of central California; to the north rise the higher hills of the Diablo Range, a sparsely settled region of forest, chaparral, and rangeland. The hills around the Livermore Valley are for the most part covered with grasses. Agriculture remains the major land use east of LLNL, but land to the north is being developed for light industrial uses. Similarly, to the west, land once used for agricultural purposes is being developed because of increased land sales, creation of subdivisions, and annexations by the city of Livermore. On its southern perimeter, LLNL shares East Avenue with Sandia National Laboratory, with which it also shares fire protection functions, a cafeteria, parking lots, and utilities. Figure 2 shows a site plan of the LLNL main site.

Site 300, which is considered part of LLNL, comprises 11 square miles, and is located in both Alameda and San Joaquin Counties, about 18 miles east of the LLNL main site. Site 300 was established as a remote explosives facility to support theoretical and developmental work performed at the LLNL main site. Site 300 is used primarily for performing high explosive tests, although assembly testing is also conducted there. Portions of Site 300 used to support these activities include the firing and test areas, chemistry and process areas, and the general administration and support areas. The area surrounding Site 300 is sparsely populated, with most of the land used to support sheep and cattle ranching. Figure 3 provides a plan of Site 300.

LLNL is operated by the University of California (UC) under contract to DOE. Founded as a nuclear weapons design laboratory in 1952, it was officially established as Lawrence Radiation Laboratory, the nation's second laboratory dedicated to nuclear weapons research and development. LLNL has been operated by UC ever since, for the Atomic Energy Commission (AEC) until 1975, for the Energy Research and Development Administration (ERDA) until 1977, and now for DOE. LLNL is a multiprogram, mission-oriented institution engaged in theoretical and applied research programs requiring a multidisciplinary approach.

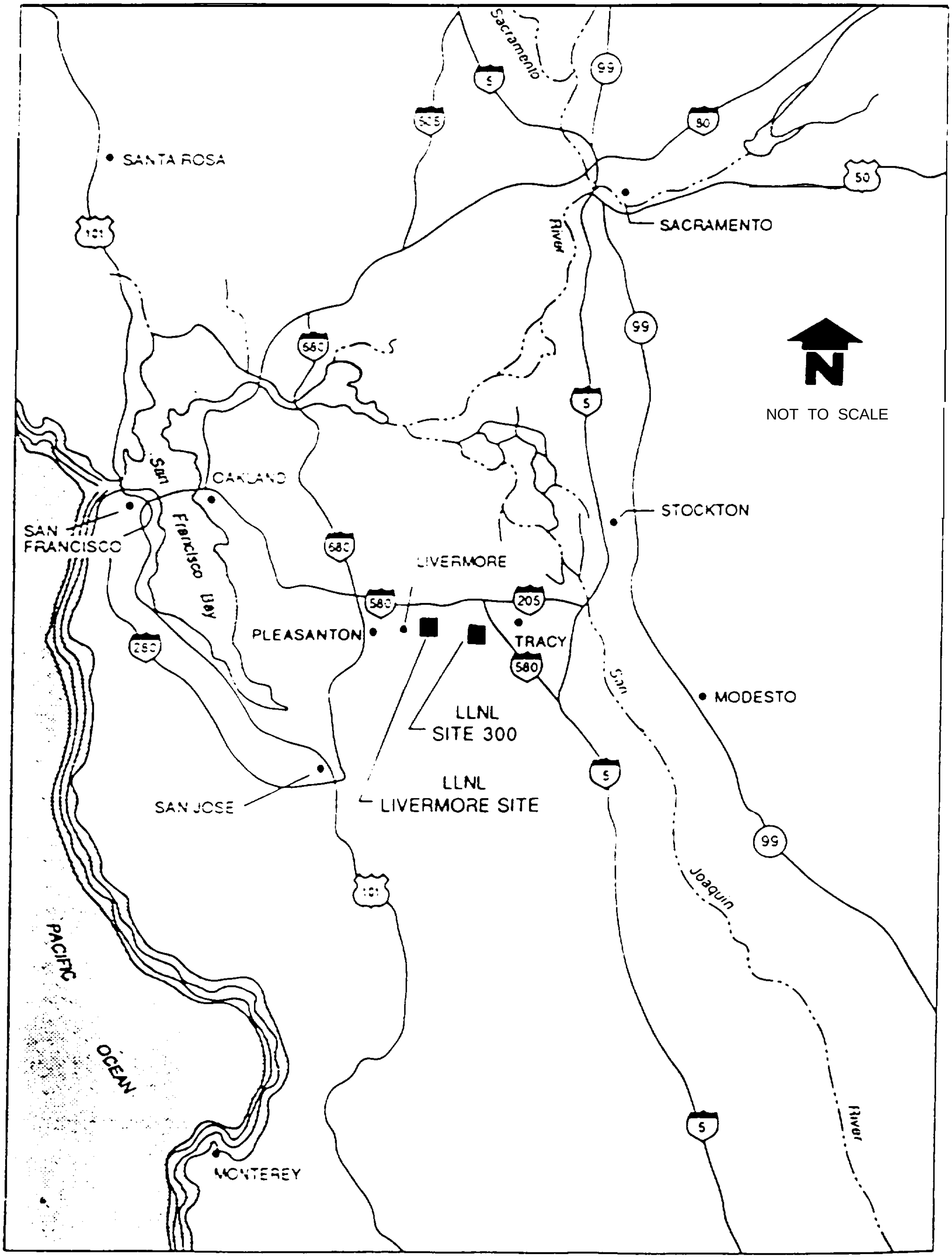


FIGURE 1. LLNL Location

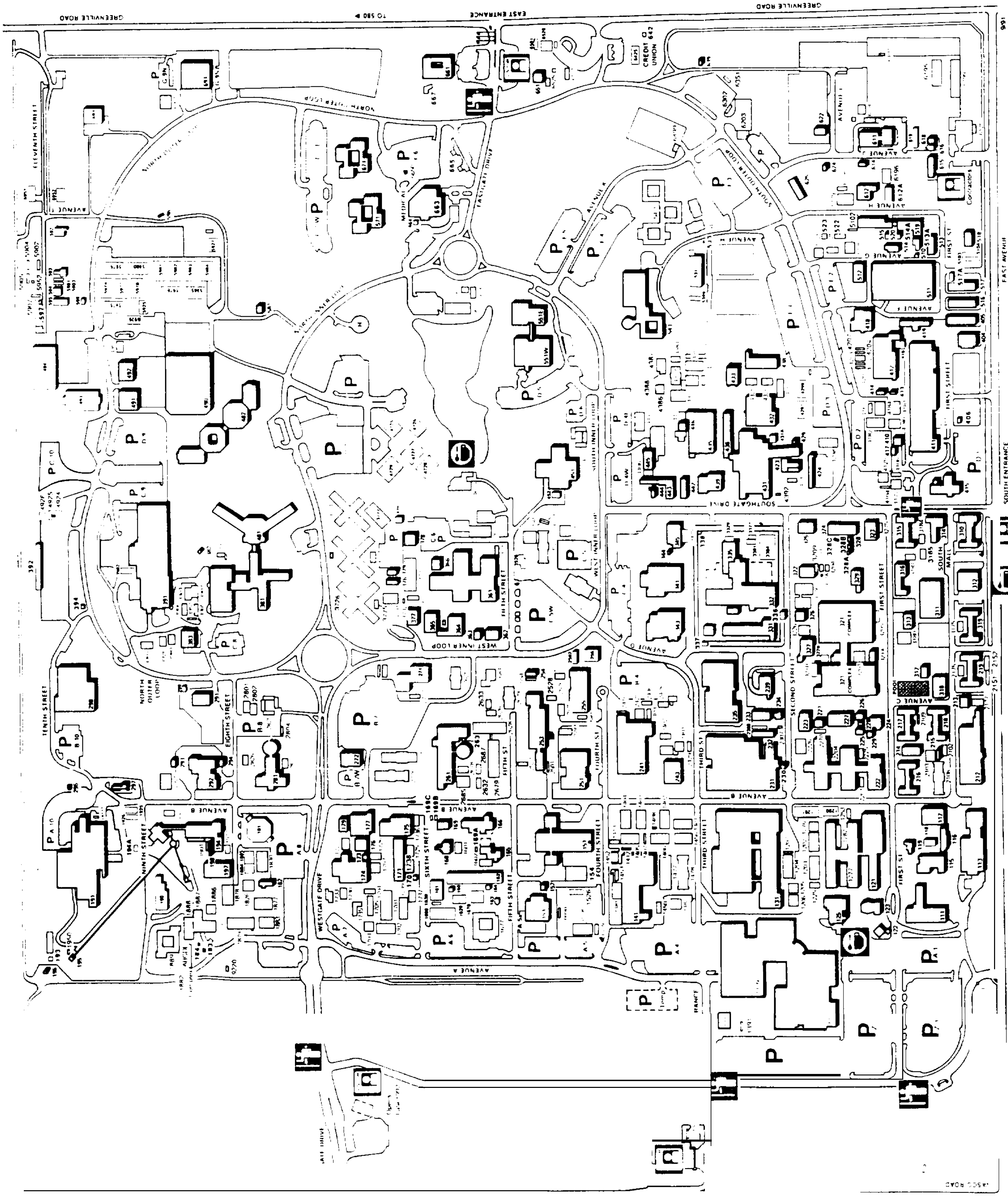


FIGURE 2. LLNL Main Site

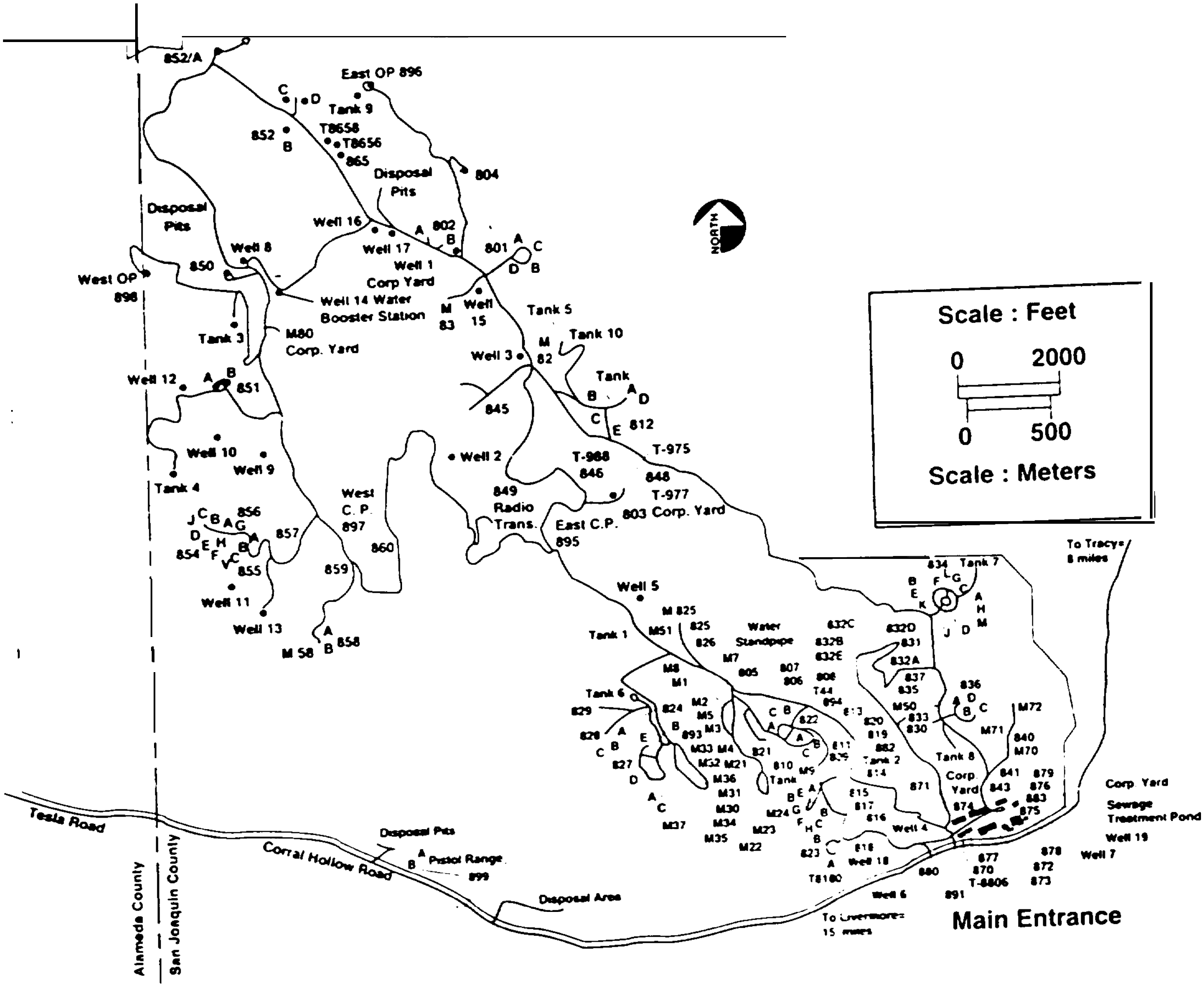


FIGURE 3. LLNL Site 300

Major programs at LLNL include research, development, and test activities associated with the nuclear design aspects of the nuclear weapons life cycle and related national security tasks; inertial confinement fusion; magnetic fusion energy; biomedical and environmental research; laser isotope separation; energy-related research; beam research physics; and support to a variety of the Department of Defense and other Federal agencies. Site 300 provides the ability to develop new high explosives or fabricate high explosives from raw materials, the ability to manufacture and assemble parts for testing, test facilities for destructive and nondestructive testing, support for projects using high explosives, diagnostics, and the capability to perform particle beam research.

1.3 **Facilities Visited**

Visiting every DOE facility at LLNL was not possible under the time constraints of this review. As a result, the field verification team focused its efforts to achieve the maximum results possible in the time available. Operations selected for field review focused on research and laboratory activities performed in facilities managed by LLNL's Chemistry and Materials Science (C&MS) Directorate, including Buildings 222-229, referred to as the B-222-229 Complex; Building 235; and Buildings 825, 826, and 827 A-E, referred to as the B-825-827 Complex. Building 153 (the Electronics Engineering Microfabrication Facility), Building 322 (the Metals Finishing Facility), and the City of Livermore Fire Station No. 2 were also examined.

The B-222-229 Complex consists primarily of operating laboratories for a variety of research projects and chemical analysis activities. Only B-225 is temporarily inactive and is undergoing renovation for conversion to general laboratory space. For each building reviewed, the current or most recent mission, a brief description, and the square footage are provided in Table 1.

Table 1. Profile of B-222-229 Complex

BLDG NO.	MISSION	DESCRIPTION	SIZE (SQ FT)
B-222	Laboratoy	Contains 75 laboratories, 97 offices, I conference room, and 4 bathrooms.	64,524
B-223	Machinery and general industry	Contains six offices, three shops, one mechanical equipment room, and two bathrooms,	5,855
B-224	Laboratory	Contains nine support laboratories, three offices, two mechanical equipment rooms, and one bathroom.	4,003
B-225	Process facility, vacant at this time	Contains two industrial shops, four chemistry laboratories, one mechanical equipment room, and one office.	1,515
B-226	Laboratory	Contains six chemistry laboratories and one mechanical equipment room.	1,219
B-227	Laboratory	Contains 15 chemistry laboratories, 1 mechanical equipment room, 9 offices, and 2 bathrooms.	8,640
B-228	Waste storage facility or site	Consists of one large room with a center divider.	166
B-229	Chemical storage facility or warehouse	Consists of one large room with a center divider.	637

Building 235 contains laboratories and administrative offices and is 97,979 square feet in size. The building consists of three levels; the basement level contains several mechanical utility rooms, partitioned areas used for programmatic storage, a service machine shop, and two laboratories. The first floor houses 42 research and development laboratories and 73 offices, 4 mechanical utility rooms, 2 copy rooms, 1 lunchroom, 2 conference rooms, and 4 bathrooms. The second floor houses 66 offices, 2 copy rooms, 3 conference rooms, 2 bathrooms, 2 rooms used for storage (1 of which is used for secured storage), 3 mechanical equipment rooms, and 1 janitorial storage room.

The B-825-827 Complex consists of research laboratories used for processing energetic materials and components. One section of this Complex (i.e., B-827, Area D-2) is used occasionally to develop prototype explosive materials using pilot-plant scale equipment. For each building reviewed, the current or most recent mission, a brief description, and the square footage are provided in Table 2.

Table 2. Profile of B-825-827 Complex

BLDG NO.	MISSION	DESCRIPTION	SIZE (SQ F-r)
B-825	Process facility	An explosive processing facility that consists of two remote processing cells, a mechanical equipment room, and an office/control room that includes a bathroom.	1,224
B-826	Process facility	An explosive processing facility that consists of two remote processing cells, a mechanical equipment room, and an office/control room that includes a bathroom.	1,742
B-827A	Process facility	Consists of a basement where the mechanical equipment room and a large inert storage room are located; the first floor contains a research and development explosive processing laboratory, three offices, a remote control room, and a change room/bathroom.	4,264
B-8276	Machinery and general industry	Consists of two rooms; one room is used for a conventional machine shop, and the second **room is** used to perform small-scale inert assembly work and to provide an office area for the supporting machinist.	861
B-827C	Process facility	An explosive processing facility that consists of two remote processing cells, a mechanical equipment room, an **inert storage room, and a service magazine.** The top and both ends are covered with earth. The building front is constructed such that if an unplanned event were to occur, overpressure would be vented through the doors and frangible walls.	3,509
B-827D	Process facility	An explosive processing facility that consists of two remote processing cells, a mechanical equipment room, an inert storage room, and a service magazine. The top and both ends are covered with earth. The building front is constructed such that if an unplanned event were to occur, overpressure would be vented through the doors and frangible walls.	3,509
B-827E	Process facility	An explosive processing facility that consists of two remote processing cells, a mechanical equipment room, an inert storage room, and a service magazine. The top and both ends are covered with earth. The building front is constructed such that if an unplanned event were to occur, overpressure would be vented through the doors and frangible walls.	3,509

2.0 SUMMARY OF RESULTS

The field verification process was designed to verify the accuracy and completeness of the data provided by LLNL in its field self-evaluation. The verification process also offered an opportunity to scrutinize Laboratory practices and thereby to identify potential chemical safety vulnerabilities. This process enabled informed judgments to be made about the seriousness of these conditions and development of a prioritized list of chemical safety vulnerabilities at selected LLNL facilities. In addition, this process will assist in subsequent determination of DOE-wide chemical safety vulnerabilities.

During the onsite portion of the review, team members visited the facilities that participated in the self-evaluation effort (i.e., the B-222-229 Complex, B-235, and the B-825-827 Complex) to verify reported observations and to look for other conditions and circumstances that could result in chemical safety vulnerabilities. Specifically, the review included an assessment of chemical management procedures; identification of properties (e.g., corrosive, reactive, toxic, carcinogenic, energetic) of hazardous materials; examination of human resource programs; facility walkthroughs; interviews with staff from the C&MS Directorate, the Plant Operations Directorate (including the staff from the Hazards Control Department and the Environmental Protection Department), the Engineering Directorate, and the Emergency Preparedness Response Program; and an evaluation of the applicable safety documentation (e.g., operating procedures).

Three facilities that were not involved in the original LLNL self-evaluation were also visited and have provided valuable information for the review. These included B-1 53 (the Electronics Engineering Microfabrication Facility), B-322 (the Metals Finishing Facility), and city of Livermore Fire Station No. 2.

The field verification review was organized to include five functional areas:

- Identification of chemical holdings, including the properties of chemicals located at the facility, the characterization of those chemicals, and an analysis of the inventory.

- Facility physical condition, including engineered barriers, maintenance conditions, the chemical systems, safety systems, storage, monitoring systems, and hazards identification.

- Operational control and management systems, including organizational structure; requirements identification; hazard analysis; procedural adherence; maintenance control; engineering and design reviews; configuration control; safe shutdown plans; and site programs for quality assurance, chemical safety, inventory control, access control, disposal, transportation and packaging, and corrective actions.

- Human resource programs, including technical competence, staffing, training and qualifications, employee involvement, employee concerns, personnel performance requirements, and visitor and subcontractor control.

- Emergency management program, including the emergency response plan, inplant consequences, environmental issues, coordination with the community, and community right-to-know issues.

Summaries of these functional areas are provided in the sections below.

2.1 Identification of Chemical Holdings

The LLNL self-evaluation provides a summary of the status of chemical holdings, primarily located in reviewed buildings under the C&MS Directorate, and controls implemented to reduce or eliminate potential employee exposures and releases to the environment. Overall, sitewide progress has been made toward enhancing hazardous chemical control programs since the July 1992 Chemical Safety Oversight Review,

Hazardous chemical inventories in the LLNL buildings reviewed are in laboratory-scale quantities that are less than 25 percent of the threshold quantities identified in 29 CFR 1910.119 and 40 CFR 68. Limited verification was made of previously identified threshold quantities of chemical holdings in B-322. Although a range of potentially hazardous chemicals, including carcinogens and energetic materials, are routinely used in the different buildings, control measures have been implemented to mitigate personal exposures and generation of significant quantities of hazardous wastes.

A comprehensive, online, computerized, Laboratory-wide chemical tracking system (ChemTrack) and a material safety data sheet system are in the initial stages of implementation at LLNL. Bar-code labeling will make possible the tracking of current chemical purchases and existing individual chemical containers throughout the Laboratory (see Section 2.3). ChemTrack will facilitate compliance with regulatory requirements, including 40 CFR 370, "Community Right-to-Know," and Executive Order 12856, "Toxic Material Release Inventory Reporting Program." The Chemical Exchange Warehouse (CHEW) is an example of another LLNL program currently being implemented to enhance use and control of chemicals and to reduce quantities of hazardous wastes, The CHEW allows for the reapplication of excess chemicals in lieu of classification as hazardous wastes.

Hazardous waste inventories for the buildings are managed in accordance with State of California Waste Management Regulations under delegated authority from the U.S. Environmental Protection Agency. Containers of hazardous chemicals are stored in a manner that prevents or minimizes the potential for inadvertent releases of contained materials. Waste generators maintain satellite accumulation areas at each generation site. These generators receive annual training in hazardous waste generation and certification.

Procedures have been implemented within the C&MS Directorate to assist in proper labeling and container management and to ensure that all wastes are characterized and sent to the treatment, storage, and disposal (TSD) facility within the allowable accumulation time. The C&MS Directorate uses the full-time services of a Hazardous Waste Management Technician to be responsible for and manage hazardous waste generated within the C&MS Directorate, thus freeing researchers from routine hazardous waste management requirements. Generators of hazardous waste retain ultimate responsibility for waste generated in a given location. The practice of using a designated staff member for the implementation of the hazardous waste control program is commendable.

A complete historical inventoty of chemical residuals has not been developed for the individual buildings reviewed. However, necessary documentation is available to facilitate characterization of the potential hazards associated with residuals. LLNL has an informal procedure to facilitate the determination of whether there are chemical residues in areas such as inactive piping, vents, and tanks. Examples of suspected residual chemicals include perchlorates and uranium residues in exhaust ductwork, mercury in some drain lines, and explosives dusts in ventilation ducts. During a recent renovation of laboratory space, samples of both potential radioactive and chemical residues from pipes and ducting were collected by a staff member. Approval will be given to the building manager to remove the ducting only after satisfactory characterization and remediation of the duct contents.

Operating exhaust stacks, vents, and sources of fugitive emissions are inventoried yearly during air quality compliance self-assessments. A commendable system to calculate and classify potential air emissions has been developed at LLNL. The system, the Emissions Measurements and Information Tracking System, is in use at LLNL to classify and perform calculations on about 650 air emission sources. A patent application has been filed on this unique system.

About 98 percent of the water discharges at LLNL have been identified, inventoried, and evaluated to determine the need for mitigation controls. The remaining water discharges have proven difficult to characterize given operational and security considerations.

Routine measurements are performed on both hazardous and mixed wastes by personnel assigned to the LLNL Environmental Analytical Sciences (EAS) Laboratory. Samples are collected and sent to the Laboratory by trained EAS Laboratory sampling personnel. As an added precaution against improper waste characterization, and as a quality assurance check, about 10 to 15 percent of all wastes are randomly selected (at the onsite interim status storage facility) for recharacterization. Materials determined to have no associated radioactive component can then be shipped to offsite TSD facilities.

Industrial hygiene technical support for operations in C&MS Directorate locations is provided by personnel from ES&H Team 3 at the main site and ES&H Team 1 at Site 300. The Technical Leader for Industrial Hygiene, from the Technical Policies and Procedures Division of the Hazards Control Department, monitors the field program to ensure consistent implementation of the program throughout LLNL. Specific industrial hygiene support activities include (1) review of operational safety procedures (OSPS) and facility safety procedures (FSPS); (2) completion of special hazards assessment forms to address health concerns with special procedures or processes; (3) review of project work plans (i.e., documents describing new work and major changes to existing work); and (4) support for the release of excess equipment and chemical agents.

The Hazards Control Department industrial hygiene staff has developed a new form to facilitate characterization of workplace hazards. The Hazards Assessment and Control Form was developed as an integral part of the Sample Tracking and Reporting Program to enhance the ongoing conduct and documentation of hazards and to comply with current and proposed

DOE requirements. This form is a commendable practice because it provides ineffective means of hazards identification by including the technical perspective of the Hazards Control Department and direct contact with the employee in the workplace. Completion of the Hazards Assessment and Control Form enhances existing procedures (see Section 2.4) and facilitates identification of potential occupational exposures and subsequent implementation of necessary workplace controls. Hazards assessment data provide information to operations personnel and the medical department. Full implementation of the revised hazards assessment process using the new form is expected to be completed by the end of the current calendar year.

2.2 **Facility Physical Condition**

Generally, the conditions of the B-222-229 Complex, B-235, and the B-825-827 Complex were observed to be as described in the LLNL self-evaluation. All facilities were in fair to good condition, with the exception of B-222, which was classified by the Laboratory as being in poor condition. Of all the facilities examined, Building 222 presents the greatest maintenance management challenge. A large maintenance backlog exists, and conduct of maintenance is difficult due in part to a leaking roof and the deteriorating condition of much of the mechanical equipment on the roof. For safety and health considerations, maintenance activities must include implementation of a series of administrative controls, such as roof access permits, and must be coordinated with laboratory scientists (who must shut down experiments in chemical fume hoods) to reduce the potential for maintenance personnel injury or uptake of chemical fumes emanating from the multiple fume hood ventilation systems.

Building 222 is **40** years old and is scheduled for transition to D&D within the next 5 years. A conceptual design review, which examines and estimates the cost of various options, has been partially completed for this building. The recommended option described in this review is to vacate the building in late 1995 and to commence building demolition. Planning activities are under way and adequate for this stage of the moving process. Planning for relocation of building occupants to other facilities and for waste characterization activities is not complete.

A relatively large quantity of the toxic chemical beryllium hydride is stored in B-229, a concrete building with a wood-tar-asphalt sheet roof. The beryllium hydride is stored in glass or plastic bottles inside bags with steel overpacks. A roof fire could result in dispersal of the beryllium hydride. A preliminary hazards analysis is under way for this facility (currently classified as low hazard, nonnuclear) to evaluate the potential risk associated with a fire.

Maintenance programs are in place to control work activities. Providing a safe working environment requires the cooperative efforts of both maintenance and Hazards Control Department personnel. Maintenance personnel have formed an independent safety committee to promote safe work practices. The activities of this committee resulted in implementation of a commendable roof access control system that has been recognized as instrumental in improving work safety, especially for activities at B-222. The B-222 staff worked closely with the maintenance department to establish the above-noted safe work practice.

One vulnerability related to the uncertainty of the final disposition of aging or inactive facilities was identified. An example is B-222, which has excessive maintenance costs and has reached the end of useful life. A more detailed discussion of this vulnerability is provided in Section 3.2 and in Attachment 2 of this appendix.

2.3 Operational Control and Management Systems

LLNL management has established systems that currently ensure the chemical safety of operations to an acceptable degree. The Laboratory is organized by directorates. Each directorate has an Assurance Office, headed by an Assurance Manager who reports directly to the Associate Director, for providing assurance that elements are in place to maintain adequate safety in each organizational unit.

A major part of this review concentrated on the chemical safety program in the C&MS Directorate, because all the facilities examined in the LLNL self-evaluation are under the auspices of this organization. However, discussions with the Associate Director of the Plant Operations Directorate and the Deputy Department Head of the Hazards Control Department indicated that analogous programs of chemical safety are being pursued in directorates throughout the Laboratory.

Procurement of hazardous chemicals is effectively controlled by stipulations in the LLNL *Procurement Manual,* the *LLNL Health & Safety Manual,* and the *LLNL Hazards Control Manua/.* These stipulations require that experts in the Hazards Control Department review and approve (if indicated) requests for procurement of special hazardous chemicals (such as carcinogens and toxic gases). Evidence was provided that the system is functioning satisfactorily.

The system for management review and authorization of operations involving the use of chemicals in Laboratory facilities is defined by requirements stipulated in the *LLNL Health & Safefy Manual* and in the FSP for each facility. This system is an important element of the Laboratory hazards analysis program. In the C&MS Directorate, a project work plan (PWP) is submitted for any new or modified operation involving a use of chemicals that transcends prior laboratory experience. The PWP may indicate the need for a special OSP to ensure chemical safety of the new or modified operation. However, a PWP is not always required for new or modified operations; moreover, those situations for which exceptions are permitted to the requirement for submitting a PWP are not clearly articulated in a written protocol. Also, there is not 100 percent conformance by the experimenters to the guidelines specified in the FSP, even in cases for which a PWP is required. In addition, accident analyses are not provided in the existing safety documentation for the facilities included in the LLNL self-evaluation. These weaknesses in the Laboratory hazards analysis program are considered a vulnerability. A more detailed discussion of this vulnerability is provided in Section 3.2 and in Attachment 2 of this appendix.

LLNL is in the process of implementing a computerized ChemTrack system to maintain a record of the chemical inventory in each work area (i.e., laboratories, shops, and chemical storage facilities). Although the self-evaluation implied that ChemTrack is a real-time system, it is not. Nonetheless, this lack of a real-time feature in ChemTrack does not seriously detract from its fundamental benefit of providing management with vital information on chemical inventories, A new system, the Facility Management Information System (FAMIS), is being developed by the C&MS Directorate. When operational, FAMIS will allow a graphic display of every laboratory and facility within the Directorate and will have the potential for extending the capability sitewide. Linking FAMIS with ChemTrack would enable an almost instant display of the ChemTrack inventory data at any selected geographical location at LLNL, and would thus provide valuable safety-related information to anyone coping with an emergency situation at that location. The completion of the development and implementation of FAMIS is being delayed by lack of funding. Development and implementation of these two management systems is considered commendable.

Another commendable practice is the continuing supporl given by LLNL to the Albuquerque Operations Office (AL) Toxic Materials Coordinating Committee (TMaCC). The TMaCC has been supporting the DOE Office of Defense Programs activities since 1975. LLNL operations management and industrial hygiene personnel have actively supported the initiatives of the committee during this nearly 20-year period. Personnel from LLNL have chaired the committee and have provided valuable support in the identification and control of toxic chemicals used throughout the DOE weapons complex. Contributions made by LLNL are recognized as a model for support of toxic material control initiatives applicable throughout DOE.

2.4 **Human Resource Programs**

The review of human resource programs focused on examining of staffing levels, chemical safety training program design and implementation, and the depth of employee concerns and assistance programs. LLNL and C&MS Directorate policy documents related to chemical safety programs at the Laboratory were also reviewed. Training documents were examined to determine the strategy for implementing the policy. Implementation of policy and program content was addressed with C&MS management and staff. In addition, program managers outside the C&MS Directorate using the B-222 Complex, supervisors having personnel matrixed to the B-222 Complex, and the LLNL Training Manager were interviewed.

C&MS staffing levels are sufficient to ensure that personnel do not work excessive hours and have sufficient time to address chemical safety considerations. In addition, a variety of health and safety professionals are available to support the LLNL directorates through ES&H teams. The teams consist of professionals from fire protection, industrial hygiene, industrial safety, environmental protection, health physics, pressure safety, and criticality safety. The team supporting C&MS has sufficient resources to oversee routine and nonroutine chemical activities and provide technical assistance on a timely basis. ES&H Team 3 has a technician assigned full time to the B-222 Complex.

The C&MS Directorate has implemented an Ombudsman Program to provide a resource outside the line organization to address employee concerns. Employees consider the program to be effective and useful, and employee confidentiality is maintained. The Deputy Associate Director for Operations in the C&MS Directorate is the management contact point for the program. Also, C&MS has implemented the DOE Occupational Safety and Health Protection Program in conjunction with the LLNL Sample Tracking and Reporting Program. Through the Sample Tracking and Reporting Program, an employee can request that an evaluation of any perceived hazard be performed by the Hazards Control Department by simply submitting the Hazard Evaluation Request Form or by requesting that the department complete a Hazard Assessment Control Form (see Section 2.1).

The C&MS Directorate established the Office of Deputy Associate Director for Assurances to perform oversight and assessment of the adherence to ES&H policies, procedures, and quality assessment requirements of LLNL and the C&MS Directorate. During February 1993, that office conducted a comprehensive self-assessment of training and qualification programs within the C&MS Directorate. In August 1993, a corrective action plan addressing the findings of the training self-assessment was prepared. The corrective actions identified by the C&MS Directorate have not been completed.

Employee training is the collective responsibility of the individual and the immediate supervisor within the individual's home group, the supervisor of the facility in which the individual works, and the supervisor of the program in which the individual participates. Extensive communication is required to establish and maintain a cohesive and effective safety training function in the LLNL matrix organization. Supervisors are responsible for ensuring that individuals receive the requisite training of their respective organizations. The designation of safety training requirements, the emphasis on completion of the training, and the accuracy and retention of records vary greatly between organizations. Considerable variation in the understanding of training requirements also exists.

The LLNL training course that addresses the safe handling of cryogenic liquids does not reflect the personal protective equipment (PPE) requirements of the LLNL *Healfh & Safety Manua/.* Hence, personnel following the guidance provided in the training class are not necessarily using the appropriate PPE and are not conforming to the safety requirements of the LLAU *Hea/th & Safety Manual.*

A chemical vulnerability exists for the B-222 Complex in the area of chemical safety training. LLNL personnel are entering potentially hazardous work environments without the benefit of training that correctly addresses the chemical hazards associated with the work environment. In addition, the work environment of some employees has not been evaluated to determine whether facility-specific chemical hazards training is warranted. A more detailed discussion of this vulnerability is provided in Section 3.2 and in Attachment 2 of this appendix.

2.5 **Emergency Management Program**

Provisions for emergency response at LLNL include emergency plans and procedures, hazards analysis, emergency equipment, responder training, drills and exercises, and coordination between the Laboratory and the community.

The LLNL Draft *Emergency Plan* **7993** is the central document that establishes and describes the Laboratory's overall emergency management program. Facility -level procedures for emergency response are provided in the FSPS and the Self-Help Plans. Responder-specific procedures are provided in additional documents (e.g., LLNL *Fire Department Operations Manua/,* Procedure 1612, "Hazardous Materials Response Plan").

The Laboratory has a system in place to respond to an emergency involving hazardous materials. In the event of an emergency at an LLNL facility, a "91 1" telephone call is made, facility occupants evacuate to a predesignated assembly point, and the LLNL Fire Department provides primary emergency response. A "911" telephone call to the LLN L 24-hour-a-day emergency dispatcher would initiate fire department response. Fire department resources include three onshift companies (i.e., four persons each with one company located at Site 300), a duty chief officer, firefighting and emergency medical vehicles/equipment, and a dedicated hazardous materials response vehicle. Firefighters are trained in hazardous materials response (at the “specialist” or “technician” level in each company), and as emergency medical technicians. The onshift captains are trained as incident commanders. The onshift captain at the scene assumes the role of incident commander until relieved by a chief officer. Technical assistance is provided to the incident commander by personnel from the Hazards Control and Environmental Protection Departments with expertise in such disciplines as health physics, industrial hygiene, industrial safety, explosives safety, and environmental protection. If additional fire, hazardous materials, and/or emergency medical response resources are needed, firefighters and vehicles from surrounding communities are provided in accordance with the community mutual aid agreements.

The close working relationship that has been established between the LLNL Fire Department and the fire departments of surrounding communities is commendable. The extent of coordination and cooperation is exemplified by joint participation in training and drills, monthly meetings with community officials, successful public relations activities, the automatic mutual aid agreement with the city of Livermore, the absence of funding issues, and use of the LLNL dedicated hazardous materials vehicle for offsite emergencies.

Conversely, implementation of the UM *Drafl Emergency Plan 1993* in the event of a sitewide hazardous materials emergency is not certain because the formal procedures to implement the plan have yet to be developed. These procedures (i.e., the Emergency Plan Implementing Procedures) are to identify the detailed actions necessary to achieve an integrated, sitewide emergency response as set forth in the plan. The Laboratory is in the process of, but has yet to complete, development of these procedures. Absence of these procedures represents an LLNL sitewide vulnerability. A more detailed discussion of this vulnerability is provided in Section 3.2 and in Attachment 2 of this appendix.

3.0 CATEGORIZATION AND PRIORITIZATION OF VULNERABILITIES

3.1 Criteria

A vulnerability is a weakness or potential weakness involving hazardous chemicals that could result in a threat to the environment, the public, or worker health and safety. Vulnerabilities can be characterized by physical or programmatic conditions associated with uncertainties, acknowledged weaknesses, and/or unacknowledged weaknesses in the area of chemical safety. Conditions required to create the vulnerability should either currently exist or be reasonably expected to exist in the future based on degradation of systems and chemicals or through expected actions.

A vulnerability will be determined to exist if current or expected future conditions or weaknesses could result in either of the following:

- The death of or serious physical harm[2] to a worker or a member of the public or continuous exposure a worker or member of the public to levels of hazardous chemicals above hazardous limits; or

- Environmental impacts resulting from the release of hazardous chemicals above established limits.

The prioritization of chemical safety vulnerabilities is based on the professional judgment of team members concerning the immediacy of the potential consequences posed by each vulnerability and on the potential severity of those consequences. The first step in the prioritization process was to group vulnerabilities according to the timeframe in which they are expected to produce consequences. The following categories have been established for the timeframe within which the consequences are expected to occur:

- Immediate — Any chemical safety vulnerability that could result in immediate consequences.

- Short-Term — Any chemical safety vulnerability at a facility in which there is a significant chance of a consequence occurring within a 3-year timeframe as a result of chemical degradation, change in mission for the facility, degradation of the containment systems, change in personnel at the facility, or other factors affecting the facility.

- Medium-Term — Any chemical safety vulnerability at a facility in which there is a significant chance of a consequence occurring within a 3–1 O-year timeframe as a result of chemical degradation, change in mission for the facility, degradation of the containment systems, change in personnel at the facility, or other factors affecting the facility.

- Lena-Term — Any chemical safety vulnerability at a facility in which there is a significant chance of a consequence occurring in the timeframe of more than 10 years as a result of

[2] Serious physical harm is defined as impairment of the **body, leaving part of the body functionally useless or substantially reducing efficiency on or off the job.**

chemical degradation, change in mission for the facility, degradation of the containment systems, change in personnel at the facility, or other factors affecting the facility.

Vulnerabilities within each category are further prioritized, based on the severity of the potential consequences, as “high,” “medium,” or “low” priority. Consequences of high severity would cause death or irreversible injury or illness to workers or the public, or would cause environmental damage that is irreversible or very costly to remediate. Low-severity consequences would be reversible injuries, illness, or environmental damage.

3.2 Chemical Safety Vulnerabilities at Lawrence Livermore National Laboratory

Four vulnerabilities were identified during the conduct of this review, all having short-term consequences.

CSVR-LLNL-FM-OI: Limited Strategic Planning for the Disposition of Aging/Inactive Facilities That May Contain Residual Amounts of Hazardous or Mixed Waste.

Building 222 has been identified as having significant maintenance problems due to the poor condition of the roof structure and the amount and deteriorated condition of the heating, ventilating, and air-conditioning equipment on the roof. The building is 40 years old and is at the end of its useful life. LLNL has substantially completed (i.e., 90 percent) a conceptual design review that documents a program for eventual D&D of the facility. This review examined three options (i.e., leave the building inactive, demolish the building, or refurbish the building for office use). The report recommended building demolition commencing in fiscal year 1995. The budgetary resources to execute any of the options examined in the conceptual design review have not been allocated.

Although this facility is operated by LLNL for the DOE Office of Defense Programs (DP), responsibility for the structure may transfer to the DOE Office of Environmental Management (EM). No decision has been made on this matter. If EM administers the D&D program after Building 222 is vacated, D&D is expected to have a low priority for funding because of the potential risk when compared with other EM-administered facilities. Currently, there are insufficient funds to implement an effective maintenance program adequately as evidenced by the significant backlog of maintenance jobs. The possibility exists that the facility will be vacated and remain so for a long time. Limiting the dispersal of the small amounts of unknown residual hazardous constituents of the facility without sufficient funds will be difficult. These conditions and circumstances represent a medium-priority vulnerability with a potential for short-term consequences.

CSVR-LLNL-MO-O1: Weaknesses in the Hazards Analysis Program.

A review of the LLNL hazards analysis program revealed two weaknesses: (1) the lack of explicit definition for the conditions under which the preparation of a project work plan (a requirement of the C&MS Directorate) is required to address new or modified operations involving the use of chemicals, plus the lack of 100-percent response from experimenters in conformance to the guidelines in preparing project work plans, and (2) the absence of accident analyses in the existing safety documentation for the facilities included in the LLNL self-evaluation. Either of these weaknesses could lead to a chemical safety vulnerability in the operation of LLNL facilities.

An incident could occur as a result of the absence of an assessment of chemical safety problems that could be introduced by a new or modified process, or by failure to consider the risks of an unaddressed credible accident (e.g., an unreviewed safety question). The potential consequences of an incident that could derive from the cited weaknesses in the LLNL hazards analysis program are personnel injury or illness and property damage. These conditions and circumstances represent a low-priority vulnerability with a potential for short-term consequences.

CSVR-LLNL-EP-O1: Absence of Emergency Plan Implementing Procedures (EPIPs) for Integrated LLNL Response to a Sitewide Hazardous Materials Emergency.

Although facility-specific and responder-specific procedures for emergency response activities (e.g., procedures for evacuation of individual facilities and for fire department response to hazardous materials spills) are currently in place at LLNL, the formal procedures that provide for an integrated, sitewide response to a hazardous materials emergency, the Emergency Plan Implementing Procedures (EPIPs), have yet to be developed. The EPIPs are identified **in the LLNL** *Draft Emergency P/an 1993* **as the** primary working documents to be followed for sitewide emergency response. The absence of these EPIPs precludes certainty that the Laboratory would implement an integrated overall response to a hazardous materials emergency.

The purpose of the plan is to describe the LLNL emergency management system, a system designed to respond to and mitigate consequences of emergencies that could threaten LLNL workers, the public, national security, or the environment. The plan is the source document for other site documents pertaining to emergency management. The plan (1) delineates LLNL emergency response policies, procedures, and commitments; (2) describes how the integrated matrix system, common to LLNL operations, functions during an emergency; and (3) specifies authorities and responsibilities within LLNL concerning the management of and recovery from emergencies. The plan describes the organizational elements, interfaces, authorities, responsibilities, resources, and predetermined actions to be taken in response to an emergency. It describes the activities necessary to ensure the readiness of the emergency response organization and sets forth the provisions for the rapid mobilization and expansion of the response commensurate with the magnitude of the emergency. The working procedures to be followed to implement the plan during an actual emergency are contained in the EPIPs.

The EPIPs, to be prepared in cooperation with the cognizant LLNL organizations having emergency response responsibilities, are intended to describe the actions necessary to implement the commitments and responsibilities set forth in the plan. These procedures are to be implemented by the sitewide LLNL emergency response organization during an emergency and are intended to be position-specific and formatted to include checklists that provide step-by-step, predetermined response actions.

Other LLNL documents pertaining to emergency management include facility-specific and responder-specific information and response procedures. For example, the FSP contains detailed safety and emergency procedures for a specific facility. LLNL Self-Help Plans provide facility-specific procedures for evacuation and assembly of facility occupants. The Run Card System provides firefighter first responders with facility-specific information essential for the initial mitigation of emergencies. The LLNL *Fire Department Operations Manual,* Procedure 1612, “Hazardous Materials Response Plan,” provides the procedures for response to spills of hazardous materials. The absence of EPIPs could result in a sitewide hazardous materials emergency and represents a low-priority vulnerability with a potential for short-term consequences.

CSVR-LLNL-MT-O1: Personnel Entry Into Hazardous Work Environments **Without Benefit of Chemical Safety Training.**

A chemical vulnerability exists at the B-222 Complex in the area of chemical safety and hazards identification training. LLNL personnel are entering potentially hazardous work environments without the benefit of training that correctly addresses the chemical hazards associated with the work environment. In addition, the work environment of some employees has not been evaluated to determine whether facility-specific chemical hazards training is warranted,

The chemical vulnerability in training presents a threat to worker health and safety that could result in the exposure of personnel to chemical agents above acceptable concentrations. Individuals unaware of the proper procedures, safety precautions, and chemical hazards associated with the chemicals in a laboratory could, through inadvertent use or spill of a chemical, unnecessarily expose themselves or co-workers to excessive levels of corrosive, reactive, carcinogenic, or toxic materials. These conditions and circumstances represent a low-priority vulnerability with a potential for short-term consequences.

Attachment 1

TEAM COMPOSITION

Area of Responsibility	Name/Organization
Team Leader	Leonard M. Lojek Office of Performance Assessment U.S. Department of Energy
Management/Operations	Leon H. Meyer The LHM Corporation
Management/Training	Thomas L. Van Witbeck TOMA Enterprises
Chemical Process Safety	Harold J. Groh HJG, Inc.
Industrial Hygiene	Michael C. Garcia Albuquerque Operations Office U.S. Department of Energy
Environmental Protection	Clifford H. Summers Arthur D. Little, Inc.
Maintenance	David M. Johnson Program Management, Inc.
Emergency Management	Thomas A. Kevern Program Management, Inc.
Site Liaison	Charles A. Taylor Livermore Site Office U.S. Department of Energy
Chief Coordinator	Mary E. Meadows Environmental Management Associates
Coordinator-In-Training	Norma B. Cameron Office of Performance Assessment U.S. Department of Energy
Coordinator-In-Training	Lisa L. Alexander Program Management, Inc.
Technical Editor	Robert F. McCallum McCallum-Tumer, Inc.

ATTACHMENT 2

CHEMICAL SAFETY VULNERABILITY REVIEW
VULNERABILITY FORM **DATE: April 27,1994**

Site/Facility: LLNL

Vulnerability Number: CSVR-LLNL-FM-O1

Functional Area(s): Facility Physical Condition, Operational Control and Management Systems

1. Brief Description of Vulnerability.

Limited strategic planning for the disposition of aging/inactive facilities that may contain residual amounts of hazardous or mixed waste

2. Summary of Vulnerability.

Building 222 Chemistry Laboratory is approximately 40 years old, and the roof and some mechanical equipment are deteriorating. Extensive maintenance is required to bring the facility up to current accepted standards. The building is tentatively scheduled to undergo decontamination and decommissioning (D&D) in less than 5 years, but activities such as characterization of suspected hazardous or mixed waste are not complete. Planning for moving the current occupants to other facilities is not complete, and funding is uncertain. Program responsibility for accomplishing the D&D of the facility has not been formally established between either the DOE Office of Defense Programs (DP) or the DOE Office of Environmental Management (EM), and the facility could potentially remain vacant for a long period of time after current operations are suspended.

3. Basis.

a. Requirements: Multiple Federal and State environmental regulations.

b. Chemicals Involved: Multiple laboratory hazardous/toxic chemicals (e.g., heavy metals, organic chemicals, acids, radioactive materials), typically in small amounts and potential residual unknown mixed waste.

c. Relevant Self-Evaluation Data: The LLNL self-evaluation identified the leaking roof condition and characterized the condition of B-222 as poor.

d. Contributing Causes:
- The facility may be transitioned to EM-60 for D&D. It will probably be low on the priority list of funding for EM D&D projects.
- Present funding for building maintenance activities is inadequate as evidenced by a large ($7 million) backlog. Roof replacement costs are estimated at $15-$20 million. Funding requests for upkeep of the facility are routinely rejected by DP.
- Formal planning for final disposition of the facility is not complete. The new facility, which will house the present chemistry operations, is still under construction.

e Potential Consequences:
- Building 222 is at risk to remain vacant and unoccupied for a long period of time following completion of present operations. The contents of the building, which include asbestos and unknown residual amounts of mixed/hazardous waste, are vulnerable to dispersal/migration.
- Characterized as a medium-priority vulnerability with a potential for short-term consequences.

CHEMICAL SAFETY VULNERABILITY REVIEW
VULNERABILITY FORM (Page 2) **DATE: April 27, 1994**

Site/Facility: Lawrence Livermore National Laboratory

Vulnerability Number: CSVR-LLNL-FM-O1

Functional Area(s): Facility Physical Condition, Operational Control and Management Systems

4. Supporting Observations,

- The condition of the roof has resulted in a number of leaks from rain and condensate. Repair activities of the mechanical roof-mounted systems are frequent and extensive in nature, resulting in excessive wear on the roofing system. Craft maintenance personnel operate safely, as long as strict administrative controls are followed.

- The site has not completed the formal Condition Assessment Survey and subsequent entry of data into the data base. This survey is used by DP to prioritize surveillance and maintenance funding for its operating facilities.

- LLNL has partially completed a conceptual design review that documents a program for eventual D&D of the facility. This review examined three options (i.e., leave the building inactive, demolish the building, or refurbish the building for office use). The report recommended building demolition commencing in fiscal year (FY) 95. This date could be delayed by up to 2–3 years. A request for D&D funding has been made for FY 98. DP has not approved this funding.

- A significant backlog of maintenance ($7 million) exists.

- Demolition of the facility may result in generation of mixed waste, but no characterization of the hazards associated with removal of this waste has been conducted.

- Planning activities related to D&D of B-222 are just beginning. Planning activities to complete the move to new facilities are partially complete. An LLNL task force for space and site planning has recently been established to identity and evaluate options when facility transitions occur.

CHEMICAL SAFETY VULNERABILITY REVIEW
VULNERABILITY FORM

DATE: April 27, 1994

Site/Facility: Lawrence Livermore National Laboratoy

Vulnerability Number: CSVR-LLNL-MO-O1

Functional Area(s): Operational Control and Management Systems, Identification of Chemical Holdings

1. Brief Description of Vulnerability.

Weaknesses in the hazards analysis program

2. Summary of Vulnerability.

Weaknesses noted in elements of the hazards analysis program that could lead to a chemical safety vulnerability were (1) the lack of explicit definition for the conditions under which preparation of project work plans is required to address new or modified operations or equipment involving the use of chemicals plus the lack of total response of experimenters in conforming to the guidelines for submitting project work plans (when required) and (2) the absence of accident analyses.

3. Basis.

a. Requirements:
- DOE 5481.1 B, "Safety Analysis and Review System"
- SAN MD 5481.1A, "Safety Analysis and Review System"
- M-01 O, LLA/L *Health & Safety Manua/,* Chapter 2
- CMS-94-304, *ES&H Management Plan*
- *FSP-222,* "Facility Safety Procedure," C&MS, Building 222 Complex
- FSP-235, "Facility Safety Procedure," C&MS, Building 235 Complex
- UCI D 21416, *Safety Ana/ysis and Review of the Existing 825, 826, 827 Chemistry Facilities*

b. Chemicals Involved: All hazardous chemicals in inventory.

c, Relevant Self-Evaluation Data: The LLNL self-evaluation indicated that hazards analyses for the identified facilities are judged to be satisfactory and to present no chemical vulnerabilities.

d. Contributing Causes:
- Lack of implementation of stipulated hazards analysis requirements.
- Inadequate definition of protocol to be followed in implementing requirements.
- Lack of analyses of worst-case accidents.

e. Potential Consequences:
- Personnel injury or illness.
- Property damage,
- Characterized as low-priority vulnerability with a potential for short-term consequences.

3ite/Facility: Lawrence Livermore National Laboratory

Vulnerability Number CSVR-LLNL-MO-O1

Functional Area(s): Operational Control and Management Systems, Identification of Chemical Holdings

1. Supporting Observations.

Project Work Plans:

- The LLNL *Health & Safety Manual* (p. 2-1) states that the facility safety procedures (FSPS) authorize and provide controls for long-term activities and use of hazardous materials.
- **The** FSP for the B-222-229 Complex (p. 4) and B-235 (p. 5) lists “new operations or significant changes to existing operations” as *requiring* a C&MS Directorate Project Work Plan.
- The C&MS ES&H Management *Plan* (p. 5-1) states that ES&H issues must be evaluated for new facility or programmatic projects before commencing work and that this requirement is met through the use of the C&MS Directorate Project Work Plan.
- Discussions with C&MS Directorate management personnel, however, revealed that a project work plan is not always required for new operations or changes to existing operations; moreover, those situations for which exceptions are permitted to the requirement for submitting a project work plan are not clearly articulated in a written protocol (although Section B. 1.1 of FSP-222 does address operations that are authorized under the FSP and hence do not require a project work plan). Also, discussions with the C&MS Directorate Operations Manager indicated that response from experimenters has not been 100 percent, even in those cases for which a project work plan is required by the guidelines specified in the FSPS.
- This indicated lack of explicit definition for conditions under which a project work plan is required for new operations or significant changes to existing operations plus the lack of total response from experimenters in conforming to guidelines for preparing project work plans (when required) introduces an uncertainty in the procedure, which could lead to a chemical safety vulnerability.

Accident Analyses:

- Existing safety analysis documents for the B-222-229 Complex, B-235, and the B-825-827 Complex do not contain analyses of worst-case accidents and consequences and do not provide a quantitative estimate of risk from these facilities, LLNL plans to include accident analyses in preliminary hazards analyses and safety analysis reports (SARS) that are scheduled to be prepared for the B-222-229 Complex and B-235, Several SARS for facilities at Site 300 that are in the review or draft stage contain detailed accident scenarios and quantitative risk analyses. In addition, extensive accident analyses are summarized in DOE/El 5-0157, *Final Environmenta/ impact Statement and Environmenta/ impact Report for Continued Operation of Lawrence Livermore National Laboratory and Sandia National Laboratories, Livermore* (Appendix D), However, these analyses define bounding accident scenarios for the LLNL site and do not provide information to mitigate accidents in specific buildings within the scope of this review.
- Among the facilities reviewed, the B-222-229 Complex and B-235 present relatively low potential for chemical safety vulnerability. Activities in these facilities normally involve only small quantities of hazardous chemicals in research and development experiments; furthermore, training, engineering controls, and administrative controls are satisfactory to reduce risks. Buildings B-222, B-227, B-229, and B-235 are classified as “low” hazard, nonnuclear facilities; B-223, B-224, B-225, B-226, and B-228 are classified as “excluded” from requiring formal safety analyses. Buildings B-825, B-826, and B-827 are classified as “moderate” hazard, nonnuclear facilities, and present relatively greater risk than the B-222-229 complex and B-235 because of the processing of large quantities of high explosives.
- The absences of quantitative risk information from accident and analyses results in greater uncertainty in judging the adequacy of existing safety controls.

CHEMICAL SAFETY VULNERABILITY REVIEW
VULNERABILITY FORM

DATE: April 27, 1994

Site/Facility: Lawrence Livermore National Laboratory

Vulnerability Number: CSVR-LLNL-EP-O1

Functional Area(s): Emergency Management Program

1. Brief Description of Vulnerability.

Absence of Emergency Plan Implementing Procedures (EPIPs) for integrated LLNL response to a sitewide hazardous materials emergency

2. Summary of Vulnerability.

The ***draft LLNL Emergency P/an 7993*** provides an overall description of the site's emergency management program and the response organization. As stated in the plan, the primary working documents to be followed to achieve an integrated, sitewide emergency response are the procedures contained in the EPIPs. At present, these EPIPs are not in place.

3, Basis.

a. Requirements:
- DOE 5500.3A, Paragraph 11d (2)
- UC RL-MA-1 13311, ***LLNL*** **Emergency** ***P/an 7993*** (draft), Section 1.1

b. Chemicals Involved: All hazardous materials at LLNL,

c. Relevant Self-Evaluation Data: LLNL self-evaluation (i.e., B-222-229 Complex, p. 21; B-235, p. 17; and B-825-827 Complex, p. 17) states that the working procedures to be followed during an actual emergency are contained in the EPIPs. The self-evaluation states that the adequacy of the program is considered "satisfactory."

d. Contributing Causes:
- Lack of implementation of identified requirements.
- Sufficient resources have not been applied to the task of procedure development. At present, one experienced contract individual on a part-time basis is developing these procedures.

e. Potential Consequences:
- Implementation of the sitewide emergency plan for response to an actual emergency is not certain without procedures.
- LLNL managerial emergency response would likely be accomplished on an ad hoc basis.
- Reviewed facilities do not appear to contain source terms sufficient to result in an emergency with impact beyond the respective facility.
- Characterized as a low-priority vulnerability with a potential for short-term consequences.

Site/Facility: Lawrence Livermore National Laboratory

Vulnerability Number: CSVR-LLNL-EP-01

Functional Area(s): Emergency Management Program

4. Supporting Observations.

- DOE 5500.3A requires the use of procedures to implement emergency plans.
- The draft LLNL Emergency Plan 7993 states that procedures termed EPIPs are the mechanism for implementing the plan.
- The LLNL self-evaluation states that the procedures to be followed during an actual sitewide emergency are contained in the EPIPs.
- Review of available LLNL documentation identified facility-specific and responder-specific emergency response plans and procedures, but no sitewide EPIPs.
- Interviews with the cognizant LLNL point-of-contact confirmed that EPIPs are currently being developed.

Site/Facility: Lawrence Livermore National Laboratory

Vulnerability Number: CSVR-LLNL-MT-O1

Functional Area(s): Human Resource Programs

1. Brief Description of Vulnerability.

Personnel entry into hazardous work environments without benefit of chemical safety training

2. Summary of Vulnerability.

Personnel are entering potentially hazardous work environments without the benefit of training that correctly addresses the associated chemical hazards. In addition, the work environment of some employees has not been evaluated to determine if facility-specific chemical hazards training is warranted.

3. Basis.

a. Requirements:
- LLNL ***Hea/th & Safety Manua/,*** Supplement 22.01, "Safe Handling of Cryogens"
- "Facility Safety Procedure 222"
- ***C&MS Training*** Program, Appendix B, "C&MS Training Requirements"
- Chemical Safety Training Course, HS4240
- Pressure Safety Orientation Training Course, HS503 (currently HS5030)
- Laboratory Safety Training Course, HS4246
- 29 CFR 1910.120, "Hazardous Waste Operations and Emergency Response"
- 29 CFR 1910.1200, "Hazard Communication"
- 29 CFR 1910.1450, "Occupational Exposure to Hazardous Chemicals in Laboratories"

b. Chemicals Involved: Cryogenic liquids and all hazardous chemicals in inventory

c. Relevant Self-Evaluation Data: **The LLNL self-evaluation considered the LLNL *Training Prograrn Manual*** and the Chemistry & Materials Science Training Plan to be "satisfactory." "Training tracking" was considered to be "good."

d. Contributing Causes:
- The application of safety training requirements to specific job assignments, the emphasis placed on completion of the training, and the accuracy and retention of records vary greatly among organizations.
- The communication required to establish and maintain a cohesive and effective safety training function in the LLNL matrix organization is extensive. Currently, communications regarding work assignments, job location, and required safety training do not ensure that all matrixed personnel receive the proper safety training.
- Considerable variation in the understanding of the safety training requirements was noted.
- The LLNL training addressing the safe handling of cryogenic liquids does not reflect the personal protective equipment (PPE) requirements of the LLAIL ***Hea/th & Safefy Manual*** hence, personnel following the guidance provided in the training class are not necessarily using the appropriate PPE and are not conforming to the safety requirements.

e. Potential Consequences:
- Personnel injury,
- Property damage.
- Characterized as a low-priority vulnerability with a potential for short-term consequences.

Site/Facility: Lawrence Livermore National Laboratory

Vulnerability Number: CSVR-LLNL-MT-O1

Functional Area(s): Human Resource Programs

4. Supporting Observations.

- In a chemical laboratory area, an LLNL staff member was observed transferring cryogenic liquids without using proper PPE.
- An LLNL subcontractor was observed performing a bulk transfer of cryogenic liquids without the use of proper PPE.
- The curriculum for Pressure Safety Orientation (Course No. HS5030), which addresses cryogenic safety, states that glove, eye, and face protection are recommended but not required. The LLNL *Health & Safety Manua/,* Supplement 22,01, states, "Using safety glasses with side shields is required at all times when cryogenic fluids are present . . . . If a cryogen is poured or if the fluid in an open container may bubble, a full face shield is required."
- An evaluation to determine the need for facility-specific training of the janitorial staff assigned to the B-222 Complex has not been performed and facility-specific training requirements have not been established for janitorial staff.
- A review of the training records of the B-222 Complex janitorial staff indicated there are no unique training requirements associated with an assignment involving work in a chemistry laboratory.
- A comparison of the C&MS Directorate roster of B-222 residents and the list of those personnel having completed the required chemical safety course (i.e., either Laboratory Safety, HS4246, or Chemical Safety, HS4240) revealed that six people, including several analytical chemists, have not completed either course. The Training Requirements and Qualifications data base was used as the source of information.
- A new LLNL employee, assigned to a chemical laboratory for several months, has been performing wet chemistry without the benefit of supervision. The employee has not attended the required chemical safety course.
- Employee training is the collective responsibility of the individual and the immediate supervisor within the individual's home group, the supervisor of the facility in which the individual works, and the supervisor of the program in which the individual participates. Each supervisor is responsible to ensure that each individual receives the requisite training required by his or her organization.

Attachment 3

SELECTED ACRONYMS

AEC	U.S. Atomic Energy Commission
AL	DOE Albuquerque Operations Office
CHEW	Chemical Exchange Warehouse
CSVR	Chemical Safety Vulnerability Review
C&MS	Chemistry and Materials Science (Directorate)
DOE	U.S. Department of Energy
DP	DOE Office of Defense Programs
D&D	Decontamination and Decommissioning
EAS	Environmental Analytical Sciences (Laboratory)
EH	DOE Office of Environment, Safety and Health
EM	DOE Office of Environmental Management
EPIP	Emergency Plan Implementing Procedure
ERDA	U.S. Energy Research and Development Administration
ES&H	Environment, Safety, and Health
FAMIS	Facility Management Information System
FSP	Facility Safety Procedure
LLNL	Lawrence Livermore National Laboratory
OSP	Operational Safety Procedure
PPE	Personal Protective Equipment
PWP	Project Work Plan
TMaCC	Toxic Materials Coordinating Committee
TSD	Treatment Storage and Disposal
Uc	University of California

APPENDIX E

FIELD VERIFICATION REPORT
OAK RIDGE RESERVATION
APRIL 18-26, 1994

CONTENTS

ATTACHMENTS

EXECUTIVE SUMMARY

This report presents the results of a review of chemical safety vulnerabilities associated with facilities owned or operated by the Department of Energy (DOE) at the Oak Ridge Reservation. The field verification visit took place on April 18–26, 1994, and was part of the Chemical Safety Vulnerability Review being conducted by the Office of Environment, Safety and Health at the direction of the Secretary of Energy. The purpose of the review is to identify and characterize conditions or circumstances involving potentially hazardous chemicals at DOE sites and facilities. Specifically, the review is designed to identify, characterize, and prioritize chemical safety vulnerabilities that might result in (1) fires or explosions from uncontrolled chemical reactions, (2) exposure of workers or the public to chemicals, or (3) releases of chemicals to the environment.

Activities involving the use, handling , transportation, and storage of hazardous chemicals at Oak Ridge include production-related processes and operations; laboratory processes; long-term, large-scale storage; and the treatment and disposal of hazardous wastes. Field verification activities at Oak Ridge included all elements of the lines of inquiry developed for the Chemical Safety Vulnerability Review. All facilities included in the Oak Ridge self-evaluations were reviewed, and additional facilities were reviewed when further information was needed.

The Oak Ridge field verification was conducted with a view toward identifying possible DOE-wide chemical safety vulnerabilities. Five chemical vulnerabilities were identified, none of which represents a condition with severe potential consequences in the near term:

- Uncharacterized areas containing potentially hazardous materials are increasingly accessible;
- Chemicals are stored in facilities not designed for that purpose;
- Facilities were placed in caretaker status without appropriate cleanup or documentation;
- Inconsistent formality and rigor are applied to managing hazardous materials; and
- Large quantities of specialty and other industrial chemicals are stored without consistent strategic planning.

These vulnerabilities, along with those identified at other DOE sites in the next phase of the Chemical Safety Vulnerability Review, will be evaluated to identify DOE-wide generic vulnerabilities. Information from the ongoing Surplus Facilities Inventory Assessment and the extended review of facilities where there may be organic-nitrate Vulnerabilities (similar to those at Tomsk-7) will also be considered. Work products from these other activities will be reviewed and may provide additional insights on possible chemical safety vulnerabilities.

Chemical safety vulnerabilities identified at each site are made available for use in developing management response plans, which in turn will provide input for the DOE-wide management response plan.

The field verification team has also identified the following commendable practices related to chemical safety at Oak Ridge:

- The use of the Hazardous Materials Information System and a computer-based bar-coding system to inventory and track hazardous chemicals and wastes, and

- Significant efforts to screen and analyze hazards at each of the Oak Ridge sites.

1.0 INTRODUCTION

1.1 Purpose and Scope

Based on direction from the Secretary of Energy, the Assistant Secretary for Environment, Safety and Health established the Chemical Safety Vulnerability Working Group to review and identify chemical safety vulnerabilities within the Department of Energy (DOE). The information obtained from the review will provide the Working Group with valuable input for identifying generic chemical safety vulnerabilities that confront the DOE complex. Identifying and prioritizing generic chemical safety vulnerabilities will enhance the Department's focus on programs, funding, and policy decisions related to chemical safety. The Secretary directed the Office of Environment, Safety and Health to lead this review, with the full participation of DOE line programs having operational responsibilities.

The Chemical Safety Vulnerability Review was designed and undertaken to identify and characterize adverse conditions and circumstances involving potentially hazardous chemicals at facilities owned or operated by the Department. Specifically, the review was designed to identify, characterize, and prioritize chemical safety vulnerabilities that might result in (1) fires or explosions from uncontrolled chemical reactions, (2) exposure of workers or the public to hazardous chemicals, or (3) release of hazardous chemicals to the environment. Using input provided by line organizations with operational responsibilities, the Working Group developed a project plan[1] to guide the review.

This report documents activities related to the field verification phase of the Chemical Safety Vulnerability Review. The field verification process was designed to use independent teams of technical professionals with experience in a variety of technical disciplines to verify the accuracy and completeness of the data compiled during the field self-evaluation phase of the review. The field self-evaluation process used a standardized question set developed and distributed by the Working Group to collect data related to chemical safety from 84 facilities at 29 sites. Based on review of this information, nine sites, including the Oak Ridge Reservation, were selected to participate in the field verification phase of the review.

The field verification team visiting Oak Ridge examined a broad range of facilities (based on facility type and operational status), with special attention given to those facilities being transferred to, awaiting, or undergoing decontamination and decommissioning (D&D). Several types of chemical- and waste-handling facilities—including laboratories, process facilities, landfills, waste treatment and storage facilities, and hazardous materials storage facilities—were examined. (See Section 1.3 for a listing of the key facilities examined.)

The field verification team, under the direction of a DOE team leader, was composed of DOE and contractor personnel with technical expertise in various aspects of chemical safety, including management and operations, training, chemical process safety, industrial hygiene, maintenance, environmental protection, and emergency preparedness. A team composition list is provided in Attachment 1 of this appendix.

[1] "Project Plan for the Chemical Safety Vulnerability Review," dated March 14, 1994.

The team began its review by visiting each of the sites selected for field verification. The team met with management or technical representatives from each of the Oak Ridge facilities reviewed. Individual and small group meetings were also held, and team members conducted facility walkthroughs, document reviews, and personnel interviews to gather information related to potential chemical safety vulnerabilities at Oak Ridge. The team leader met daily with local DOE and contractor management to discuss the team's activities and to review issues that may have surfaced during the previous day. Before the field verification team left Oak Ridge, DOE and contractor management conducted an onsite factual accuracy review of the draft report. An outbriefing was conducted on Tuesday, April 26, 1994, and a draft copy of this report was transmitted to the Oak Ridge Operations Office (OR).

1.2 **Site Description**

The Oak Ridge Reservation is situated in Roane and Anderson Counties, Tennessee, about 30 miles west of Knoxville and adjacent to the city of Oak Ridge. The Reservation comprises about 35,000 acres and includes three major sites: the K-25 Site, the Oak Ridge Y-1 2 Plant, and Oak Ridge National Laboratory (ORNL). (See Figures 1 and 2.) Most of the facilities associated with ORNL are located at X-10 Site, although some ORNL divisions are located at Y-1 2 and K-25. Some facilities at all three Oak Ridge sites were originally constructed during World War II. Martin Marietta Energy Systems (MM ES) has been the principal management and operating contractor for Oak Ridge since 1984.

Located west of the city of Oak Ridge, the K-25 Site began operations in 1945 as the Oak Ridge Gaseous Diffusion Plant. K-25's original mission was to enrich the uranium-235 isotope for use in atomic weapons. The site was subsequently used to supply fuel for the commercial nuclear power industry. DOE shut down gaseous diffusion operations at the K-25 Site in 1985, and the site was placed on the Department's list of facilities designated for D&D. The site includes 118 buildings. The K-25 Site now serves as the center of operations for MMES'S environmental restoration and waste management programs, as well as for the DOE Center for Environmental Technology and the Center for Waste Management. Key activities at K-25 include technology development, technology transfer, and engineering technology.

The Y-1 2 Plant is located in the eastern part of the Oak Ridge Reservation, adjacent to the city of Oak Ridge. The plant complex consists of about 450 buildings. The original mission of the Y-1 2 Plant was the separation of uranium-235 through use of an electromagnetic process. The plant subsequently played a key role in the manufacture of weapons components. Y-12's current mission is to operate as a manufacturing center for the development and demonstration of unique materials, components, and services for DOE and for customers approved by DOE. Principal activities involve the production, reclamation, and storage of nuclear materials; the manufacture of defense components; and support for national security programs.

Bordered by the Clinch River to the south and west, ORNL was established in 1942 to produce and separate chemically the first gram quantities of plutonium for the atomic bomb. Current programs at ORNL focus on basic and applied research, technology development, and work for others. Key ORNL activities in support of DOE include energy production and conservation technologies, physical and life sciences, scientific and technological user

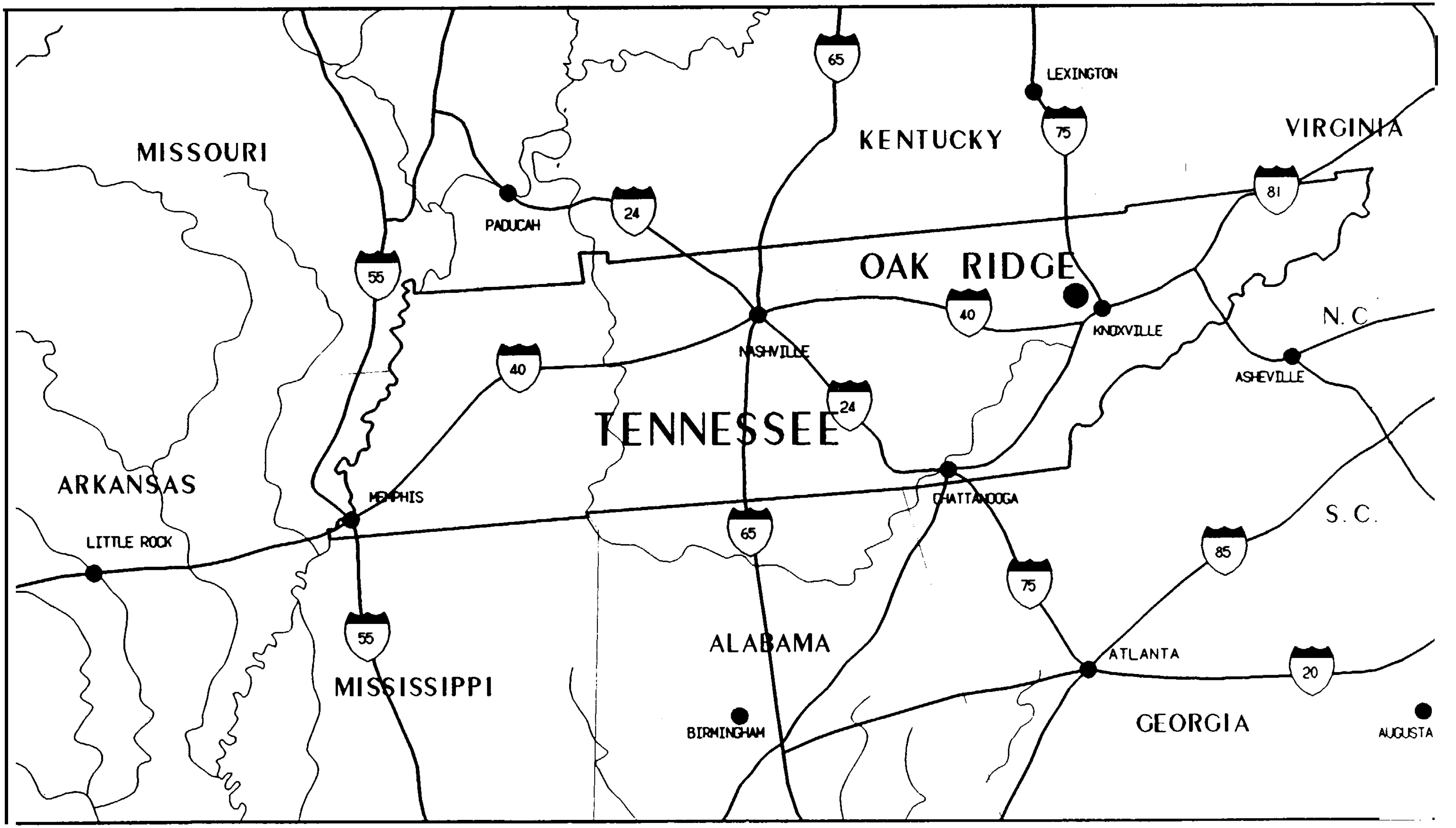


FIGURE 1. OAK RIDGE LOCATION

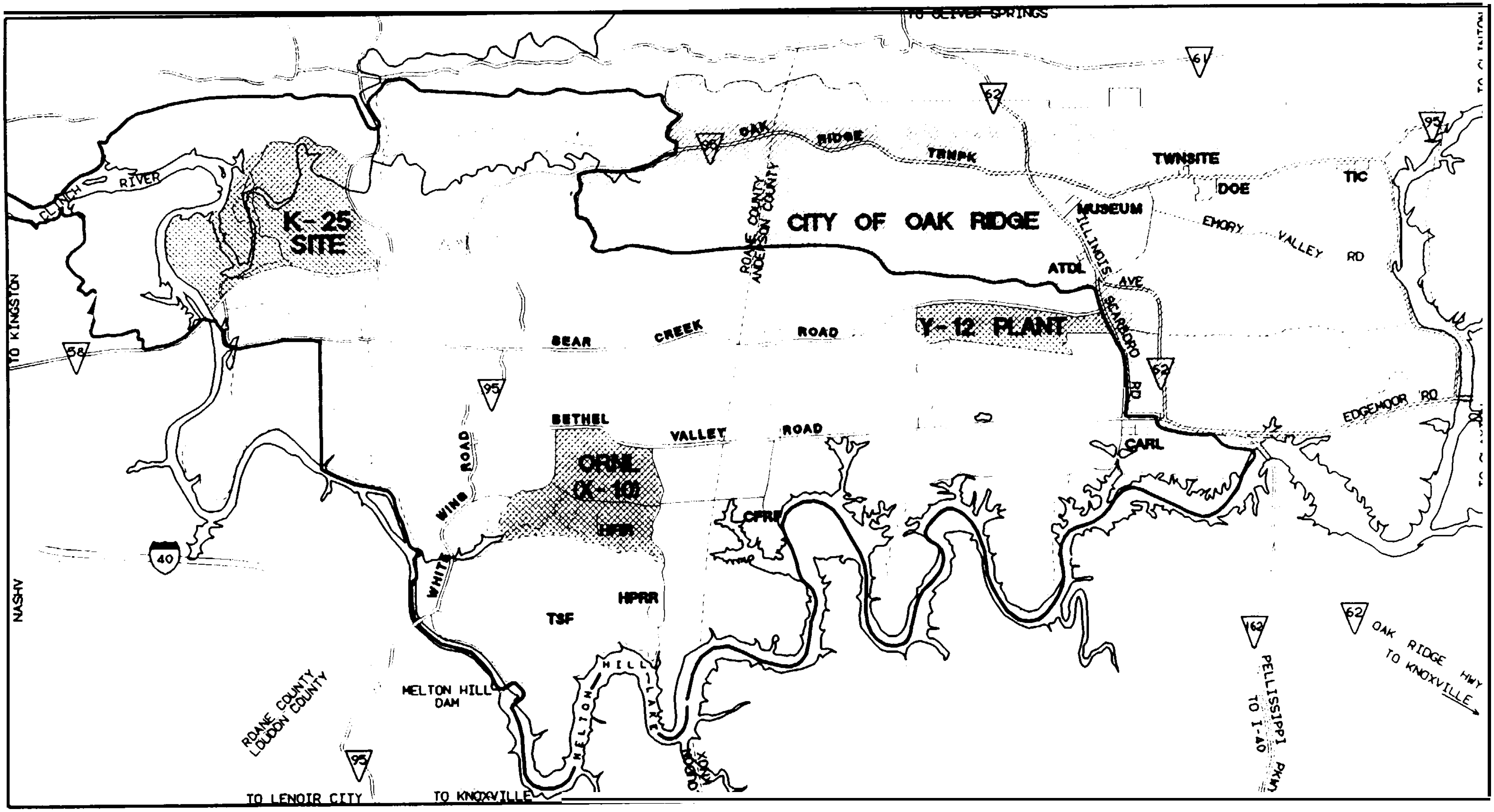


FIGURE 2. OAK RIDGE RESERVATION AND CITY OF OAK RIDGE

facilities, environmental protection and waste management, and science and technology transfer.

1.3 Facilities Visited

The field verification team visited facilities at all three Oak Ridge sites. The tables provided in this subsection identify key facilities visited by members of the-verification team and include information related to the physical condition and mission of each facility.

Table 1. Key Facilities Visited at K-25 Site.

FACILITY	MISSION	DESCRIPTION
K-107O-A Burial Ground*	Waste disposal	The 2-acre burial ground contains two distinct burial areas: trenches and waste pits. The trenches are long, narrow excavated areas in which waste was placed, then covered with soil. A typical trench measures 11 x 3 x 108 feet. Waste materials are placed in auger holes 3 feet in diameter and about 12 feet deep.
K-25 Process Building	Designed for the isotopic enrichment of uranium by the gaseous diffusion process.	Placed in operation in August 1945, the K-25 Process Building is a steel-frame structure with cement/asbestos composite siding. It is a three-level, U-shaped building with concrete floors. The length around the U is 4,975 feet. The width of the building varies around the U, with a maximum width of about 400 feet. The facility was shut down in 1964.
Lithium Storage Vaults’	Waste/environmental remediation	The lithium storage areas are located in the basement of the K-25 Process Building. A typical “vault” (i.e., a large open area) measures 300 x 61 feet.
Pond Waste Management Project*	Waste storage	The Pond Waste Management Project comprises the K-1 417-A and K-1 41 7-B Drum Storage Yards, K-305 Vaults 19-A and 19-B, and K-1419.
K-725, Beryllium Building	Support for thermal diffusion process	This building was originally designed to support the S-50 Thermal Diffusion Plant. Soon after initiation of operations, a second concrete pad was placed over the original floor because of high alpha counts from depleted uranium handled in the building. From 1946 to 1952, the building was used for the Nuclear Energy for Propulsion of Aircraft Project. The building is believed to be contaminated with beryllium, uranium, and mercury.
K-1066, Storage Yarda	Uranium hexafluoride cylinder storage	The storage yards consist of concrete or gravel pads with uranium hexafluoride cylinders stored on wooden saddles or directly on the concrete or gravel.

Facilities marked with an asterisk (’) were included in the self-evaluation process.

Table 2. Key Facilities Visited at Y-12 Plant.

FACILITY	MISSION	DESCRIPTION
Building 1405 (Johnson Control World Services)	Potable water supply for the city of Oak Ridge, Y-12, and ORNL	The plant was placed in service in the mid-1940s and has been upgraded twice, once in the 1960s and again in the 1980s. The plant has a maximum capacity of 28 million gallons per day (MGD) and is currently operating at about 15 MGD.
Building 9201-4 (Alpha-4)*	Waste/environmental remediation	Placed in operation in 1945, Building 9201-4 is a 600,000-square-foot structure fabricated of reinforced concrete, structural steel, transite siding, and double-clay tile walls. The three-story building is classified as a containment facility.
Building 9201-5 (Alpha-5)	Storage	Building 9201-5 was constructed in 1946 as a primary production facility. The 530,000-square-foot building is constructed of reinforced concrete with a steel frame and masonry walls. Alpha-5 is currently used for material storage.
Building 9202	Research and development	Placed in operation in 1954, Building 9202 is a 123,800-square-foot structure of reinforced concrete with frame and masonry walls. It houses numerous chemical laboratories.
Main Warehouse, Building 9720-5’	Warehouse	The Main Warehouse was built in 1944 to provide a storage area for enriched uranium parts and materials used in nuclear weapons and for other items containing special nuclear material. The building includes about 60,000 square feet of storage space, plus 8,000 square feet of vault storage.

Facilities marked with an asterisk ~) were included in the self-evaluation process,

Table 3. Key Facilities Visited at ORNL.

FACILITY	MISSION	DESCRIPTION
Building 3047	Radioisotope separation	Building 3047 is a three-story steel-frame building with concrete-block exterior and interior walls. It was constructed in 1962 to support research and development and the production of radioisotopes. The beta-gamma area includes hot cells, the operating areas, a decontamination room, a roof plug access area, and three low-level laboratories. The hot-cell area contains four high-level beta-gamma hot cells with 3 feet of high-density concrete or equivalent attenuation of steel and concrete. Each hot cell is equipped with oil-filled lead glass shielded viewing windows with shielding equal to that of the walls.
Waste Evaporator Facility, Building 3506”	Waste/environmental remediation	The Waste Evaporator Facility was built in 1949 and shut down in 1954. The facility consists of a gallery area and a hot cell. The gallery is constructed mostly of wood, with dimensions of about 32 x 9 x 10 feet. The cell is about 28 x 13 x 16 feet, with concrete walls of varying thickness (2–3 feet) and a stainless steel floor pan.
Contractor Landfill, Building 7658*	Above-ground storage for noncontaminated scrap metal dumpsters	The Contractors Landfill was used to bury general construction debris and demolition waste generated by ORNL contractors. No waste-specific records were kept on landfill operations, and no administrative controls were maintained, The landfill measures about 500 x 260 feet and covers an area of about 3 acres. The top of the landfill is currently being used for storing scrap metal containers.
Emergency Waste Basin, Building 7821*	Process waste storage	The Emergency Waste Basin is an emergency holding basin for radioactive process waste from ORNL. The basin, which has a surface area of about 0.6 acre and a capacity of about 2.8 million gallons, has never been used.

Facilities marked with an asterisk (“) were Included in the self-evalua[lon process

2.0 SUMMARY OF RESULTS

The field verification process was designed to use independent teams of safety professionals to verify the accuracy and completeness of data provided to the Chemical Safety Vulnerability Working Group concerning Oak Ridge facilities selected for field self-evaluation. The verification process offers an opportunity to examine potential chemical safety vulnerabilities and to make informed judgments about the possible relevance of these conditions for determinations of generic chemical safety vulnerabilities.

The goal of the field verification team was to identify chemical safety vulnerabilities at Oak Ridge. Before arriving on site, team members reviewed the self-evaluation data and other documents to develop lists of potential vulnerabilities for their functional areas. During the onsite portion of the review, team members visited facilities selected for self-evaluation to verify reported observations and to look for other conditions or circumstances that might result in chemical safety vulnerabilities. In some instances, facilities or areas that were not included in the original self-evaluation were also reviewed. In these cases, team members coordinated with their site counterparts to arrange for the appropriate walkthroughs or interviews. Completed chemical safety vulnerability forms resulting from the field verification activities at Oak Ridge are provided in Attachment 2 of this appendix.

To support effective team management and to expedite the identification of vulnerabilities across a wide range of technical disciplines associated with chemical safety, the field verification review was organized to include five functional areas:

- <u>Identification of chemical holdings</u>, including the properties of chemicals located at the facility, the characterization of those chemicals, and an analysis of the inventory.

- <u>Facility physical condition</u>, inciting engineered barriers, maintenance conditions, chemical systems, safety systems, storage, monitoring systems, and hazards identification.

- <u>Operational control and management systems</u>, including organizational structure; requirements identification; hazard analysis; procedural adherence; maintenance control; engineering and design reviews; configuration control; safe shutdown plans; and site programs for quality assurance, chemical safety, inventory control, access control, disposal, transportation and packaging, and corrective actions.

- <u>Human resource programs</u>, including technical competence, staffing, training and qualifications, employee involvement, employee concerns, personnel performance requirements, and visitor and subcontractor control.

- <u>Emergency management program</u>, including the emergency plan, inplant consequences, environmental issues, coordination with the community, and community right-to-know issues.

These functional areas were evaluated based on lines of inquiry provided in Attachment 1 of the “Field Verification Guide for the Chemical Safety Vulnerability Review,” dated April 8, 1994.

2.1 Identification of Chemical Holdings

Verification activities for the chemical holdings functional area of the Chemical Safety Vulnerability Review for the Y-1 2, K-25, and ORNL sites at Oak Ridge included all elements of the lines of inquiry. All facilities included in the site self-evaluations were reviewed. Additional facilities were reviewed whenever further information was needed.

A hazards screening of chemical usage at Oak Ridge was conducted during the initial phase of the Safety Analysis Report Update Program (SARUP) and is used by the sites as a safety basis to identify chemical hazards. Inventories of chemicals are maintained for all Oak Ridge facilities, with the methodology ranging from comprehensive computer data bases (Hazardous Materials Information System, or HMIS) to lists kept manually. When used properly, electronic data bases are highly effective tools to enhance safety and control inventories, but hand-kept lists have not proven to be as effective. A variety of problems can arise when manual and/or mixed inventory methodologies are used. For example, one Oak Ridge laboratory facility using two different manual systems and an in-house data base system did not keep track of inventory totals, with the possible (but unlikely) result that the allowable load of flammable materials in the fire zone could be exceeded. Site requirements and procedures for hazardous materials in laboratories at Oak Ridge are generally less formal and less rigorous, particularly in the area of conduct of operations, than for most other facility categories

All chemical requisitions at Oak Ridge are screened by industrial hygiene personnel for hazards, and chemicals are entered into HMIS (where used) and properly labeled (with material safety data sheet [MSDS] labels) before distribution.

A concerted effort has been made to reduce the total of the very large quantities of some chemicals (e.g., mercury lithium compounds, lubricating oils, and Freon) at Oak Ridge, and it has been successful in some cases. However, less attention has been given to smaller excess inventories of many other chemicals, including laboratory reagents that pose significant hazards. Recent efforts, though, have been initiated to develop a reservation-wide program addressing excess chemicals.

Unquantified and sometimes uncharacterized inventories of chemicals exist in inactive facilities at Oak Ridge. In the past, a number of facilities were deactivated on short notice and were not completely deinventoried. Some remediation efforts are under way, but because of potential time-dependent instabilities and the loss of corporate knowledge, the activity is now more costly and possibly more hazardous.

Storage of chemicals at Oak Ridge is largely in compliance with site procedures and with relevant regulations that require appropriate labels and segregation according to class. Very large quantities of chemicals are warehoused in shutdown production facilities that were not originally designed for this purpose. Although a significant hazard is not currently associated with this practice, risk could increase during the long-term storage of chemicals if facilities are not upgraded and properly maintained. As demonstrated by the field verification review, some storage practices need to be upgraded, including those for uranium hexafluoride cylinders, 1-ton chlorine cylinders at a water treatment plant, and chemicals in laboratories.

All sites have developed strong Resource Conservation and Recovery Act (RCRA) waste management programs and, with few exceptions, practices conform to requirements. Wastes are characterized before disposition, usually through sampling and analysis, although historical values are used in some repetitive situations. Qualified personnel review analyses and establish handling requirements to ensure proper disposition. With one exception, all RCRA and mixed-waste drum storage areas reviewed by the team demonstrated exemplary compliance with regulations and site requirements.

All sites have or will complete comprehensive surveys of water drainage systems and discharges. The surveys are used (1) to ensure proper routing of process discharges, building drains, stormwater drains, and sanitary wastes; (2) to reduce point source discharges; and (3) to evaluate opportunities for source reduction. Similar surveys of air emission points are also being undertaken-primarily in response to forthcoming permit requirements specified under Title V of the Clean Air Act Amendments. These surveys can be used as a basis for minimizing the number of vents and stacks.

In summary, inventories of hazardous chemicals in most Oak Ridge facilities are well characterized, except for those in some shutdown facilities. The use of HMIS for inventory control is considered a good practice, as is a similar computer-based bar-coding system for hazardous wastes. The efforts in some facilities to find **uses for excess chemicals are also** commendable. The chemical inventory in storage is stable and presents few unusual hazards; however, extended storage will result in increased risk as containers and facilities deteriorate further. Hazardous materials in laboratory facilities also represent a vulnerability to the extent that these facilities are allowed to operate with less rigorous procedures than those required for some other facilities. The casual handling practices and only fair housekeeping conditions that exist in some laboratories are not consistent with the objectives of site procedures or with DOE 5480.19, “Conduct of Operations Requirements for DOE Facilities,” or 29 CFR 1910.1450, “Occupational Exposure to Hazardous Chemicals in Laboratories.” (See Vulnerabilities CSVR-OR-ORR-02 and CSVR OR-ORR-04.)

2.2 **Facility Physical Condition**

Verification activities for the facility physical condition functional area of the Chemical Safety Vulnerability Review for K-25, Y-12, and ORNL included all pertinent lines of inquiry. All facilities included in the site self-evaluations were reviewed. Selected additional facilities at each site were reviewed whenever further information was needed to validate the results.

In general, the facilities visited at the three Oak Ridge sites appeared to be structurally and mechanically sound, although they do not fully comply with the engineering requirements for new facilities. In the recent past, several facilities have been reroofed to eliminate chronic water leaks. Other buildings have leaking roofs that need to be replaced, but Condition Assessment Surveys (CASS) have not been performed. For that reason, reroofing projects may not have received the appropriate funding. Delay of roof repairs could result in leaks and potential migration of residual chemicals in some Oak Ridge facilities.

Several facilities are inactive or undergoing D&D of process and process-related equipment. To maintain a safe work environment during D&D of process systems containing hazardous chemicals, these facilities are in need of preventive and corrective maintenance, periodic upgrades to infrastructure systems, and updated configuration drawings. A plan for the surveillance and maintenance for the D&D of facilities was published in December 1992. Because of the long lead time required for capital projects, CASS should be completed as soon as possible to identify required facility and infrastructure upgrades. This is particularity true when CASS are required before submission of project requests.

Based on the limited sample of corrective maintenance data for the facilities reviewed, about one-third of all open work orders are more than 90 days old. Some current work orders are not scheduled for completion until December 1994. However, at the time of this review the backlog did not include safety-related work orders.

The changing mission of Oak Ridge facilities also contributes to the need to modify and upgrade projects in a manner that will enhance safe operation. For example, during the winter of 1993–94, the testing and flushing of the fire-suppression system in the K-25 Process Building from a wet-pipe to a dry-pipe system resulted in significant freeze damage, This damage was caused by the absence of low-point drains in the piping. System modifications are required to prevent recurrences of this kind.

Some industrial facilities converted for administrative use do not meet current engineering standards. For example, many are equipped with obsolete fluorescent light fixtures containing small quantities of polychlorinated biphenyls (PCBS). The construction of the ballast does not provide for the containment of PCBS when a failure occurs. As a result, PCBS can drip onto personnel, furniture, or floors and be tracked to adjacent areas. Most facilities have been maintained in good condition. However, some facilities currently used for storage could result in a medium-priority vulnerability with a potential for long-term consequences. (See Vulnerability CSVR-OR-ORR-02.)

2.3 Operational Control and Management Systems

Operational controls and management systems were examined as part of the site visit. Although MMES has put in place an extensive array of policies and procedures related to safe management of hazardous materials, chemical safety vulnerabilities have been identified and, in part, are traceable to (1) lack of explicit sitewide guidance on controlling activities after operations have ceased (but before D&D has begun), (2) some instances where implementation of guidance could be strengthened, or (3) low priority for funding.

Each of the self-evaluation reports compiled by MMES contains a summary of program and management systems currently in place to control chemical safety vulnerabilities. MMES has implemented a management structure in which a central organization develops procedures that are generally applicable to ORN L, Y-1 2, and K-25. In addition, each of the three sites can, and often does, develop its own procedures to deal with plant-specific matters. Some buildings and programs have developed yet another layer of analyses and operational controls.

These systems provide the basis for control of hazardous material during routine operations, in accordance with DOE 5480.19 and related documents, and for control of hazardous wastes, in accordance with the detailed requirements developed for RCRA; the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); and the Toxic

Substances Control Act (TSCA). Historically, specific procedures have not been developed (or required) to provide close control over facility shutdown and cleanout or for surveillance and maintenance (S&M) prior to D&D. The implementation of management systems for such activities has been left to the discretion of each site, and implementation of good practices varies widely.

The MMES approach of using both corporate-wide and site-specific procedures provides a mechanism to ensure that all stages of the life cycle of an operation are treated with an appropriate degree of rigor, while providing flexibility for dealing with individual needs. The strength of the approach depends on the actual requirements imposed by the corporate-wide procedures and on the care exercised in assessing the vulnerabilities attending with specific activities.

As noted elsewhere, there are substantial differences in the actual implementation of systems and procedures important to chemical safety that can be traced back to fundamental differences between the sponsoring program offices at DOE Headquarters. Nonetheless, it should be noted that MMES has adopted good practices by specifically requiring that "efforts to ensure the safety of . . . operations shall be applied in ail stages of the life cycle of these operations" (e.g., Y70-81 1, "Safety of Operations," dated March 1, 1993). In recent years, a substantial effort has been made to apply this global approach to processes used for evaluating and reducing hazards.

Other management systems, such as those related to conduct of operations and maintenance, are still evolving. The February 18, 1994, Y-1 2 letter from D. Bostock to R.J. Spence of OR provides a detailed status report of efforts to implement DOE 5480.19. CASS per DOE 4320.2A, "Capital Asset Management Process," issued February 10, 1994, are being aggressively implemented at Y-12. Thirty-three facility surveys had been completed, with another 17 in process at the time of this review. The assessment process has also been initiated at ORNL. Five facility surveys have been completed, and 10 are scheduled to start before the end of fiscal year (FY) 94. Surveys have not begun at K-25 but are scheduled to start early in FY 95.

Specific procedures that apply to facility shutdown and cleanout have not been developed. For example, the MMES-wide document ESS-OP-1, "Standard for Conduct of Operations," dated March 21, 1991, has a section on performance objectives and criteria, but it provides no guidance on dealing with facility shutdown and cleanout, S&M, or D&D. The MMES Environment, Safety and Health Strategic Plan (ES/ESH/INT-2, Revision 1, dated August 1993) compounds this shortcoming by separating information on cleanup operations from the section emphasizing engineered barriers.

On the other hand, requirements for detailed management planning for D&D efforts funded by the DOE Office of Environmental Management appear to be widely used (e.g., tVPM-18, "K-25 Site Decontamination and Decommissioning Surveillance and Maintenance Annual Report FY 1993," dated November 15, 1993, and Y/ER-60, "Project Management Plan for the Decontamination and Decommissioning of Building 9201-4 at the Oak Ridge Y-12 Site," dated December 1993). Most of these documents have their widest application to new efforts and projects.

A more complete discussion of operational controls and management systems, and of their relevance to chemical safety vulnerabilities, can be found in Appendix E (for Y-12) and Appendix F (for ORNL) of DOE/EH-0282, “Task Group Report to the Assistant Secretary for Environment, Safety and Health on Oversight of Chemical Safety at the Department of Energy,” dated November 1992.

In summary, MMES has an impressive array of new operational controls and improved management systems that can be used to reduce or eliminate chemical safety vulnerabilities. There is no explicit requirement to address these issues when operations are terminated or when the use of older, noncompliant facilities is continued (see the chemical safety vulnerabilities discussed in Section 3.2). When engineered barriers are known to be weak or nonexistent, engineered solutions should be sought in lieu of long-term administrative controls.

2.4 **Human Resource Programs**

Verification activities for the human resource programs functional area of the Chemical Safety Vulnerability Review at Oak Ridge included all elements of the lines of inquiry, with particular emphasis on issues related to training, staffing, employee involvement, and visitor and subcontractor control. No explicit chemical safety vulnerability issues related to human resource programs were identified for Y-1 **2, K-25,** or ORNL.

Each of the three sites at Oak Ridge provides training to its employees through its own training organizations. In addition, workers directly involved in hazardous waste operations conducted at treatment, storage, and disposal facilities regulated by RCRA (i.e., through 40 CFR 264 and 40 CFR 265) receive initial 40-hour hazardous waste operations (HAZWOPER) training through the three Oak Ridge labor unions under a National Institute of Environmental Safety and Health (NIEHS) program. Eight- and 24-hour refresher training is provided by each site’s MMES training organization. The training provided meets Occupational Safety and Health Administration (OS HA) requirements stipulated in 29 CFR 1910.120, “Hazardous Waste Operations and Emergency Response.” MMES systems are in place to ensure that workers receive refresher training in a timely manner. All HAZWOPER workers contacted (including both MMES and subcontractor personnel) were aware of the need for and contents of the training. All training cards examined were complete and current.

Training provided to site personnel on the requirements of 29 CFR 1910.1200, “Hazard Communications,” and 29 CFR 1910.1450, “Occupational Exposure to Hazardous Chemicals in Laboratories,” was also examined. All MMES and subcontractor personnel receive basic hazard communication training as part of their general employee training package. The purpose of this training is to acquaint all personnel with the pertinent statutory requirements for hazard communications, as well as to familiarize them with warning labels, signs, and MSDSS. All site personnel are also trained on the MMES Reproductive Hazards Protection Program. Other specialized training is provided to supervisors, personnel working with carcinogens, or wearers of respiratory protection equipment. Retraining is facilitated through the use of a computerized system at all three sites. With only one exception (i.e., an instance in which an individual’s carcinogen control training had lapsed), all personnel interviewed had appropriate training that was current.

MMES is promoting a high level of worker awareness for safety issues involving chemicals. In addition to formal training, a proactive campaign (including promotional materials and special events) is in place to foster awareness of chemical safety and hazardous communications issues. ORNL is also developing an interview form that will test worker knowledge of chemical hazards in the workplace. This form will be used to document worker understanding of the chemical hygiene program at ORNL during routine industrial hygiene walkthroughs of facilities.

In summary, MMES has the necessary human resource systems to meet both DOE and OSHA requirements in the area of chemical safety. Staffing levels directly associated with chemical safety issues have increased substantially since the three sites have transitioned to environmental restoration and waste management projects. Personnel involved in these projects are well trained, motivated, and cognizant of chemical hazards in their workplace. This level of training and chemical safety awareness is still maturing within research facilities at the three sites.

2.5 **Emergency Management Program**

Verification activities for the emergency preparedness program functional area of the Chemical Safety Vulnerability Review for the Y-1 2, K-25, and ORNL sites at Oak Ridge included all elements of the lines of inquiry. All facilities included in the site self-evaluations were reviewed. Selected additional facilities at each site were reviewed whenever further information was needed to validate the results.

Emergency management programs at the three Oak Ridge sites mirror the requirements of the DOE 5500 series of Orders. Each of the three sites has developed an overall sitewide emergency plan, augmented by individual facility-specific emergency manuals or procedures for significant facilities. These plans, manuals, and procedures address multiple types of events, including chemical hazards, radiological and criticality incidents, and natural phenomena, The plans were developed using the results of a maturing hazards identification and analysis program that also supports the development and refinement of facility safety analysis reports. The level of effort and thoroughness invested in the hazards screening and analysis process, especially at K-25, is considered a commendable practice that should be emulated across the DOE complex.

In addition to these broad-based plans, the Oak Ridge sites have developed topic-specific plans on an as-needed basis (e.g., oil spill plans, hazardous materials plans). Coordination with offsite authorities and organizations is evident in the various response plans, particularly with the State of Tennessee Emergency Plan for Hazardous Material Events at DOE/Oak Ridge Facilities.

For accident consequence assessments in the hazardous materials area, the sites use the Air Force Toxic Chemical Dispersion Model, the Air Force Dispersion Assessment Model, and the Hazardous Atmospheric Release Model developed by the National Oceanic and Atmospheric Administration, with DOE sponsorship. All three sites have recently upgraded their meteorological towers and other provisions for acquiring real-time meteorological data. However, one possible area of concern involves the accuracy of these predictive models for the extremely complex terrain and micrometeorology of the Oak Ridge area. The sites are encouraged to explore the possibility of conducting confirmatory tracer studies and/or other measures to validate the codes for their sites and for the chemicals of particular interest for their operations.

The emergency plans reflect the development of extensive evacuation planning for both workers and the public. Notification of offsite authorities is addressed, as is the use of audible alert and notification systems for the public. The plans also address employee training and employee assembly and accountability during an actual event. During facility walkdowns, team members noted the extensive attention provided to these issues as exemplified by the number and highly visible nature of assembly areas throughout the three sites. Team members also noted the general availability of eye-wash stations, emergency showers, and personal protective equipment in most locations where they might be needed.

Facilities and equipment necessary for response to hazardous materials incidents are generally available, but the quality and condition of the equipment vary from site to site. Within the past 2 years, the Y-12 Site acquired a specially designed hazardous material response vehicle that is a fire-utility type truck and will support response operations up through and including Class A chemical suits. The K-25 Site also has a similar, but somewhat older, hazardous material response vehicle. Response vehicles and equipment at ORNL are not as up-to-date but are generally considered adequate. Response personnel are trained in those skills necessary to function safely during a hazardous material incident.

Exercises and drills are an integral part of the emergency management program and are adequately addressed at all three sites. Annual training is made available to offsite authorities and response organizations, as is the opportunity to participate in appropriate drills and exercises.

Although the overall state of emergency preparedness has not been identified as a significant vulnerability from the standpoint of this review, the overall level of maturity, thoroughness, and rigor of these programs varies considerably from site to site, with K-25 clearly in the lead and with ORNL placing a distant third. The K-25 Site leads its sister sites in part because of concurrent improvements developed and implemented (1) in response to the significant deficiencies in emergency preparedness identified during the EH Technical Safety Appraisal conducted in 1989 and (2) in association with the regulatory requirements for startup of the TSCA Incinerator. It should also be noted that all three sites have shown significant improvement in their emergency preparedness programs over the past few years.

3.0 CATEGORIZATION AND PRIORITIZATION OF VULNERABILITIES

3.1 Criteria

A vulnerability is defined as a weakness or potential weakness involving hazardous chemicals that could result in a threat to the environment, the public, or worker health and safety. Vulnerabilities can be characterized by physical or programmatic conditions associated with uncertainties, acknowledged deficiencies, and/or unacknowledged deficiencies in the area of chemical safety. Conditions required to create the vulnerability should either currently exist or be reasonably expected to exist in the future based on degradation of systems and chemicals or through expected actions (e.g., D&D of a facility within 2 years).

A vulnerability will be determined to exist if current or expected future conditions or weaknesses could result in either of the following:

- The death of or serious physical harm[2] to a worker or a member of the public or the continuous exposure of a worker or member of the public to levels of hazardous chemicals above hazardous limits: or

- Environmental impacts resulting from the release of hazardous chemicals above established limits.

The prioritization of chemical safety vulnerabilities is based on the professional judgment of team members concerning the immediacy of the potential consequences posed by each vulnerability and on the potential severity of those consequences. The first step in the prioritization process was to group vulnerabilities according to the timeframe in which they are expected to produce consequences. The following categories have been established for the timeframe within which the consequences are expected to occur:

- Immediate — Any chemical safety vulnerability that could result in immediate consequences.

- Short-Term — Any chemical safety vulnerability at a facility in which there is a significant chance of a consequence occurring within a 3-year timeframe as a result of chemical degradation, change in mission for the facility, degradation of the containment systems, change in personnel at the facility, or other factors affecting the facility.

- Medium-Term — Any chemical safety vulnerability at a facility in which there is a significant chance of a consequence occurring within a 3–1 O-year timeframe as a result of chemical degradation, change in mission for the facility, degradation of the containment systems, change in personnel at the facility, or other factors affecting the facility.

- Long-Term — Any chemical safety vulnerability at a facility in which there is a significant chance of a consequence occurring within a timeframe of more than 10 years as a result of

[2] Serious physical harm is defined as impairment of the body, leaving part of the body functionally useless or substantially reducing efficiency on or off the job.

chemical degradation, change in mission for the facility, degradation of the containment systems, change in personnel at the facility, or other factors affecting the facility.

Vulnerabilities within each category should be further prioritized to specify “high,” “medium,” or “low” priority based on the severity of the potential consequences. Examples of the second level of prioritization include the following:

- Prioritize potential harm to workers or the public according to the possible level of injury and/or health effect, ranging from transient reversible illness or injury to death.

- Prioritize environmental impacts based on the level of irreversible damage and/or restoration costs.

3.2 Chemical Safety Vulnerabilities at the Oak Ridge Reservation

The chemical safety vulnerabilities identified in this section were derived from the self-evaluation data and from specific observations made during the field verification process. Five vulnerabilities were identified at Oak Ridge as a result of this review.

CSVR-OR-ORR-01: **Uncharacterized areas containing potentially hazardous materials are increasingly accessible.**

Security areas at the Oak Ridge sites are shrinking as programs are cut back. The costs of maintaining such areas are high, and the Department’s increased openness promotes reduction in controlled areas, consistent with changing missions. Other access control measures, both administrative and physical, will diminish over time. At Oak Ridge, all facilities and operations have been subjected to at least a preliminary hazards screening. However, excess and abandoned facilities/sites that may not have been fully evaluated and characterized will become available for access by workers and the public. As this occurs, many individuals will not know the history of the facility/site, nor will they be aware of the real or potential hazards that may be present. The possible exposure of workers and the public to hazardous and/or toxic materials, environments, and situations without their knowledge or consent represents a high-priority vulnerability with a potential for short-term consequences.

CSVR-OR-ORR-02: **Chemicals are stored in facilities not designed for that purpose.**

Buildings and equipment are being used for purposes for which they were not intended or beyond their expected life. Some cylinders used for storing uranium hexafluoride have failed in the recent past, releasing small quantities to the atmosphere. The process of aging will accelerate as cylinders reach the end of their functional life. The storage of 23.6 million pounds of lithium hydroxide-plus smaller quantities of low-level radioactive waste, other hazardous chemicals, and chemical residuals—in steel drums represents another potential hazard. Storage areas currently being used have no climate control; thus, the drums are subject to the long-term effects of corrosion due to diurnal and seasonal extremes of temperature and humidity. Projects for storage facilities have been proposed but have not been funded. These conditions and circumstances represent a medium-priority vulnerability with a potential for medium-term consequences.

CSVR-OR-ORR-03: Facilities were placed in caretaker status without appropriate cleanup or documentation.

When a facility changes from operational to caretaker status without thorough cleanup operations, chemicals left in the facility can represent a potentially hazardous condition and/or environmental concern. Such chemicals may be hazardous in their original state or as degradation products that result over time. Chemicals and/or their degradation products may also cause damage to equipment or structures or be affected by building or container deterioration due to natural aging. The loss of corporate memory (e.g., as a result of personnel transfers and retirements, facility aging, downsizing, multiple usage, and inadequate configuration management and recordkeeping in the past) may result in chemical hazards when new operations are attempted. The potential for fire, employee exposure, inadvertent releases to the atmosphere, and higher cleanup costs represents a medium- to high-priority vulnerability with a potential for short- to long-term consequences.

CSVR-OR-ORR-04: Inconsistent formality and rigor are applied to the management of hazardous materials.

Use of the Hazardous Materials Information System for chemical inventories is an effective tool for enhancing safety and control, but it is not used in all facilities at Oak Ridge. Chemical inventories (e.g., lithium hydroxide, uranium hexafluoride) in long-duration storage are currently stable and pose normal industrial hazards, but the risk could increase during extended storage as containers and facilities deteriorate. Funds requested to upgrade storage conditions have not been obtained. Funds have been proposed to upgrade storage conditions, but in the absence of regulatory drivers, some projects have not had sufficient priority. Hazardous materials in some laboratories are excluded from the more rigorous controls specified for some other facilities. Casual handling and housekeeping practices in some laboratories are inconsistent with site procedures, DOE 5480.19, and 29 CFR 1910.1450. These conditions and circumstances represent a medium-priority vulnerability with a potential for short- to long-term consequences.

CSVR-OR-ORR-05: Large quantities of specialty and other industrial chemicals are stored without consistent strategic planning.

This potential vulnerability involves the storage of bulk quantities of unique chemicals that are now surplus to national defense programs. Chemicals stored at Y-12 and K-25 include lithium and its compounds, beryllium and its compounds, uranium hexafluoride, and mercury. Over time, unanticipated chemical hazards may result from the storage of these chemicals in temporary facilities. Chemical aging, which degrades the material to unknown byproducts, represents another potential hazard. The storage of this material also represents a long-term economic commitment by DOE. These conditions and circumstances represent a medium-priority vulnerability with a potential for medium- to long-term consequences.

Information from the ongoing Surplus Facilities Inventory Assessment and the extended review of facilities in which there may be organic-nitrate vulnerabilities (as occurred at Tomsk-7) will also be considered. Work products from these activities will be reviewed and may provide additional insights on potential chemical safety vulnerabilities.

Attachment 1

TEAM COMPOSITION

Area of Responsibility	Name/Organization
Team Leader	Victor 1. Crawford Office of Environmental Audit U.S. Department of Energy
Management/Operations	Del Bunch Management Strategies, Inc.
Management/Training	John A. Leonowich Battelle, Pacific Northwest Laboratory
Chemical Process Safety	John A. Porter JP Techsewices, Inc.
Industrial Hygiene	Paul W. Hoffman Westinghouse Waste Isolation Division
Environmental Protection	Richard R. Lunt Arthur D, Little, Inc.
Maintenance	David R. Spence Technical and Professional Services
Emergency Management	David M. Rohrer Office of Health U.S. Department of Energy
Site Liaisons	Mark Robinson Oak Ridge Operations Office US. Department of Energy
	David Sheffey Martin Marietta Energy Systems
Coordinator	Rita A, Bieri Los Alamos National Laboratory
Technical Editor	Darla Treat Courtney Environmental Management Associates

ATTACHMENT 2

CHEMICAL SAFETY VULNERABILITY REVIEW
VULNERABILITY FORM DATE: April 23.1994

Site/Facility: Oak Ridge

Vulnerability Number: CSVR-OR-ORR-01

Functional Area(s): Operational Control and Management Systems, Identification of Chemical Holdings, Facility Physical Condition

1. Brief Description of Vulnerability.

Uncharacterized areas containing potentially hazardous materials are increasingly accessible,

2. Summary of Vulnerability.

Security areas at the Oak Ridge sites are shrinking as programs are cut back. The costs of maintaining such areas are high, and the Department's increased openness promotes reduction in controlled areas, consistent with missions, Other access control measures, both administrative and physical, will diminish over time. At Oak Ridge, all facilities and operations have been subjected to at least a preliminary hazards screening. However, excess and abandoned facilities/sites may not have been fully evaluated and characterized, and some will become available for access by workers and the public, Those individuals will not know the history of the facility/site, nor will they be aware of the real or potential hazards that may be present.

3. Basis.

a. Requirements: The health and safety of workers and the public must be protected from both past and present activities involving hazardous materials.

b. Chemicals Involved: The full range of hazardous materials available over the entire operational life of the facility/site, including organic solvents, lead-based paints, acids, bases, exotic chemicals, carcinogens, and heavy metals.

c. Relevant Self-Evaluation Data:
- The self-evaluation addressed the fact that the K-1 070A Burial Ground at K-25 is known to contain chemicals, but records of specific types and quantities were not known, Organic chemicals and heavy metals **have been detected in the groundwater monitoring wells surrounding the Burial Ground, indicating that hazardous materials are migrating from the burial ground.**
- **The self-evaluation for the 9201-4 Process Building identified the presence of asbestos, lead paint, polychlorinated biphenyls, and mercury, and characterizations are under way for all such materials at the facility. The characterization of the residual mercury problems at Y-12 has been the subject of continuing studies since the "1983 Task Force Study, " which focused on mercury contamination at the Y-12 Site.**

d. Contributing Causes:
- **Loss of corporate** memory **due to personnel transfers and retirement**
- **Multiple uses of facilities/sites over time**
- Aging of chemicals and possible interactions with their surroundings
- Decreased budgets requiring expanded cost-saving measures
- Lack of appropriate resources for the orderly shutdown of and withdrawal from excess facilities.

e, Potential Consequences: The possible exposure of workers and the public to hazardous and/or toxic materials, environments, and situations without their knowledge or consent represents a high-prioriiy **vulnerability with a potential for short-term consequences.**

Site/Facility: Oak Ridge

Vulnerability Number: CSVR-OR-ORR-01

Functional Area(s): Operational Control and Management Systems, Identification of Chemical Holdings, Facility Physical Condition

4. Supporting Observations.

- Burial grounds (e.g., K-1 070-A and ORNL/Contractor Landfill [7658 area]) are characterized **only generally, and their potential hazards to the public are not known with any** degree of accuracy. Funding for full characterization has been diverted to higher priority projects. Over time, the contents and history of the site could be forgotten.

- Hazardous materials deposits or residues remain in the process equipment and piping of numerous excess or inactive facilities, such as the Gaseous Diffusion Building (K-25), the K-725 Storage Warehouse (K-25), the 9201-4 Production Building (Y-12), and the Radiochemical Development Laboratory (ORNL).

- In the past, hazardous materials have escaped from buildings and have contaminated the soil around and beneath some buildings (e.g., the 9201-4 Production Building at Y-12).

- Past operational practices involving the disposal of chemicals into building drains may have leaked hazardous materials to the soil, which has not been characterized for contaminants.

- Access on unlocked, unguarded roads in the vicinity of landfills and work areas is no longer rigorously controlled.

CHEMICAL SAFETY VULNERABILITY REVIEW
VULNERABILITY FORM DATE: April 22, 1994

Site/Facility: Oak Ridge/(Y-l 2, K-25)

Vulnerability Number: CSVR-OR-ORR-02

Functional Area(s): Operation Control and Management Systems, Facility Physical Condition

1. Brief Description of Vulnerability.

Chemicals are stored in facilities not designed for that purpose.

2. Summary of Vulnerability.

Funding requested for some dedicated storage facilities has not been provided. Therefore, the use of less-than-adequate facilities has been required. Drums could corrode, releasing chemicals to the environment and//or causing potential worker exposures. Cylinders containing uranium hexafluoride are stored outside and are exposed to the elements. Severely corroded cylinders have released uranium hexafluoride to the environment. Additional cylinder failures are expected to cause more uranium hexafluoride releases. A plan currently exists to demolish Building 9201-4 at some time in the future. In the interim, the building could be used for storage. Future use of the facility may not be consistent with the potential hazards associated with residual levels of mercury and other facility limitations.

3. Basis.

a. Requirements:
- DOE 4320.2A
- DOE 4330,4B

b. Chemicals Involved:
- Lithium hydroxide
- Uranium hexafluoride
- Mercury

c. Relevant Self-Evaluation Data: Self-evaluation responses cited management documents and control systems that are in place for selected facilities.

d. Contributing Causes:
- Adequate resources have not been provided for chemical storage.
- Formal policies for the use or disposal of excess chemicals have not been developed.

e, Potential Consequences: The continued deterioration of drums and cylinders could result in the release of chemicals and the possible exposure of workers to caustics or irritants. Releases and possible worker exposures are expected to increase in frequency as containers reach the end of their useful lives. These conditions and circumstances represent a medium-priority vulnerability with a potential for medium-term consequences.

Site/Facility:	Oak Ridge/(Y-l 2, K-25)
Vulnerability Number:	CSVR-OR-ORR-02
Functional Area(s):	Identification of Operation Control and Management Systems, Facility Physical Condition

4. Supporting Observations.

- Lithium hydroxide drums were observed stored in the lower level of the K-25 Process Building.
  - No consistent policy was used for stacking drums.
  - Storage facilities do not have adequate temperature or humidity controls.
  - Significant corrosion was evident on the exterior of many drums.
  - Deteriorated wooden pallets could fail, causing one or more drums to rupture and spill lithium hydroxide.
  - Potential personnel exposure to lithium hydroxide could occur, resulting in caustic burns.

- Cylinders containing uranium hexafluoride are stored outside and are exposed to the elements.
  - Failure of cylinder walls **due to corrosion has resulted in uranium hexafluoride leaks.**
  - **No secondary containment is used** in storage areas.

- The Alpha-4 facility may be used for chemical storage in the future.
  - Cleanup acceptance criteria based on future use have not been established.
  - Future uses that are not consistent with residual mercury, facility characteristics, and environmental conditions could result in a chemical safety vulnerability.

CHEMICAL SAFETY VULNERABILITY REVIEW
VULNERABILITY FORM

DATE: **April** 22, 1994

Site/Facility: Oak Ridge

Vulnerability Number: CSVR-OR-ORR-03

Functional Area(s): Identification of Chemical Holdings, Facility Physical Condition

1. Brief Description of Vulnerability.

Facilities were placed in caretaker status without appropriate cleanup or documentation

2, Summary of Vulnerability.

When a facility changes from operational to caretaker status without thorough cleanup operations, chemicals left in the facility can represent a potentially hazardous condition and/or environmental concern. Such chemicals may be hazardous in their original state or as degradation products that result over time. Chemicals and/or their degradation products may also cause damage to equipment or structures or be affected by building or container deterioration due to natural aging. The loss of corporate memory (e.g., as a result of personnel transfers and retirements, facility aging, downsizing, multiple usage, and inadequate configuration management and recordkeeping in the past) may result in chemical hazards when new operations are attempted,

3. Basis,

a. Requirements:
- DOE 4330.4B
- Good Practices

b. Chemicals Involved: The full range of hazardous materials over the entire operational life of the facility/site, including organic solvents, lead-based paints, acids, bases, exotic chemicals, carcinogens, and heavy metals,

c. Relevant Self-Evaluation Data: Self-evaluation responses cited management documents and control systems that are in place for selected facilities,

d, Contributing Causes:
- Adequate resources have not been provided for shutdown and withdrawal from facilities or for acquiring and maintaining historical records as part of the shutdown process.
- Changing facility missions prevent realistic projections for long-term use.

e. Potential Consequences: The potential for fire, employee exposure, inadvertent releases to the atmosphere, and higher cleanup costs represents a medium- to high-priority vulnerability with a potential for short- to long-term consequences.

Site/Facility: Oak Ridge

Vulnerability Number: CSVR-OR-ORR-03

Functional Area(s): Identification of Chemical Holdings, Facility Physical Condition

4. Supporting Observations.

- Visual observation and document reviews indicate that vaults for storage of various materials at K-25 need repair or rehabilitation.
- Limited capability to remove contaminated equipment from K-25 and elsewhere reflects insufficient management controls over the decontamination and decommissioning process. Although Freon, lubricating oils, and uranium hexafluoride have been removed from process equipment, deposits and/or residues remain in place (including trace quantities of technetium and plutonium, as well as more substantial quantities of uranium). The presence of such materials limits removal efforts.
- Building K-725 was abandoned years ago without a cleanup. The building and, in particular, the ductwork are known to be contaminated with hazardous chemicals. Warning signs are posted around the building.
- The shielded cell facility in Building 3047 at ORNL contains a sealed sump that is known to contain a radioactive residue. The manner in which the material reached the sump is unknown, but it may have been conducted through a ventilation duct or via a pipe leak. No device is in place to sample or flush the sump; thus, the sump contents are unknown. Chemical processing is no longer conducted in the cells. In the past, work in the cells involved acids, bases, solvents, and other materials that may still be in the sump. The hazards associated with the sump contents are thus unknown.
- Chemical safety vulnerabilities have resulted from the termination of the isotope separations program without a corollary for cleanout of hazardous materials at ORNL.
- Characterization of building contamination has been difficult to complete, especially for mercury residuals at Y-12.

CHEMICAL SAFETY VULNERABILITY REVIEW
VULNERABILITY FORM

DATE: April 21,1994

Site/Facility: Oak Ridge

Vulnerability Number: CSVR-OR-ORR-04

Functional Area(s): Identification of Chemical Holdings, Operational Control and Management Systems

1. Brief Description of Vulnerability.

Inconsistent rigor and formality are applied to managing hazardous materials.

2. Summary of Vulnerability.

In the absence of specific DOE Orders and/or regulatory requirements, procedures and the conduct of operations related to handling and storing hazardous materials are not uniform between sites and, in some cases, between divisions and facilities within the same site.

3. Basis.

a. Requirements:
- 29 CFR 1910.1450
- DOE 5400.1
- DOE 5480.10
- DOE 5480.19
- K-25 SPP 4111
- X-1 O IS-3,1 (Rev. 1)
- ESS-IH-140

b. Chemicals Involved: Many types and quantities of hazardous materials for activities that include long-term, large-scale storage; laboratory use and storage; and operations. Predominantly “second-tier” hazardous materials (HM categories 1 through 3) are involved.

c. Relevant Self-Evaluation Data: Self-evaluation responses cited management documents and control systems that are in place for selected facilities.

d. Contributing Causes:
- Lack of specific and/or prescriptive DOE Orders
- Lack of specific and/or prescriptive regulatory requirements
- Low funding priori for hazardous materials storage
- Inconsistent management commitment

e. Potential Consequences: The most likely environmental impacts would be localized spills that could involve reportable quantities, although offsite migration could occur. Residual environmental risks or liabilities could result. Injuries and other impacts to worker safety and health would likely be localized. These conditions and circumstances represent a medium-priority vulnerability with a potential for short- to long-term consequences.

Site/Facility: Oak Ridge

Vulnerability Number: CSVR-OR-ORR-04

Functional Area(s): Identification of Chemical Holdings, Operational Control and Management Systems

4. Supporting Observations.

(a) Lithium hydroxide from Y-12 has been stored at K-25 by two different organizations. Storage is located in controlled access areas, but storage conditions are not consistent with "good management practices." Requested funds to upgrade storage conditions have not been obtained.

- Storage Facility Condition
  - Lack of maintenance for heating, ventilation, air-conditioning, and fire protection systems has resulted in water leaks.
  - Eyewash stations and/or safety showers have not been installed at the storage areas.
  - Inadequate housekeeping was noted (e.g., dirty floors, discarded banding).

- Drum Stacks
  - Pallets were stacked three high (four drums per pallet) in some areas. Some drum sets are not banded and some wooden pallets are cracked, causing stacks to tiff slightly. The three-high stacks were reported to be early placements, and this practice is no longer followed.

- Drum Conditions
  - Not all drums were properly labeled.
  - Some drums showed significant exterior corrosion.
  - Lid lock-down band on one drum was observed to be loose.

- Inspections
  - A monthly inspection program has been instituted, but there **is no evidence that drum corrosion is monitored. Inspections have not triggered timely corrective actions for labeling or to upgrade conditions.**

(b) Examples of improper handling and storage of hazardous chemicals in laboratories and other conditions that are inconsistent with 29 CFR 1910.1450 were observed:

- Flammables, carcinogens, and corrosive chemicals stored in the same cabinet;
- Ethers not analyzed for peroxides, bottles not dated, and bottles not stored in an explosion-proof refrigerator;
- Incompatible chemicals placed in an open, improperly labeled RCRA satellite storage "area" (container);
- Inadequate housekeeping practices in some areas; and
- No potable water and no eyewash or safety shower station at one laboratory.

(c) Storage of uranium hexafluoride containers–see Vulnerability CSVR-OR-ORR-05.

CHEMICAL SAFETY VULNERABILITY REVIEW
VULNERABILITY FORM **DATE: April 22, 1994**

Site/Facility: Oak Ridge (Y-1 2/K-25)

Vulnerability Number: CSVR-OR-ORR-05

Functional Area(s): Identification of Chemical Holdings

1. Brief Description of Vulnerability.

Large quantities of specialty and other industrial chemicals are stored without consistent strategic planning.

2. Summary of Vulnerability.

The national defense mission of DOE prompted the purchase and stockpiling of industrial quantities of many unique chemicals. Because of changing strategic requirements, most of these chemicals are now surplus to DOE needs. The storage of these chemicals could result in unanticipated vulnerabilities caused by the absence of appropriate controls, chemical aging, and decomposition to unknown byproducts. It also represents the need for a long-term economic commitment by DOE.

3. Basis.

a. Requirements: There are no statutory regulations explicitly covering the long-term, “caretaker” storage of bulk industrial chemicals, either in DOE or Federal regulations.

b. Chemicals Involved: Lithium and lithium compounds, uranium hexafluoride, beryllium and beryllium compounds, and mercury.

c. Relevant Self-Evaluation Data: Self-evaluation responses cited management documents and control systems that are in place for selected facilities.

d. Contributing Causes:
- Lack of Federal/DOE regulatory requirements
- Lack of a definitive, long-term policy on the disposition of this excess material.
- Lack of research and detailed knowledge on “aging chemicals”
- Uncertainty of future requirements for stockpiling chemicals

e. Potential Consequences: Significant quantities of potentially toxic or corrosive materials could be released to the environment as the chemicals in these materials age, The potential health effects of such aging on workers and the public are difficult to quantify. These conditions and circumstances represent a medium-priority vulnerability with medium- to long-term consequences.

CHEMICAL SAFETY VULNERABILITY REVIEW
VULNERABILITY FORM (Page 2) **DATE: April 22, 1994**

Site/Facility:	**Oak Ridge (Y-12/K-25)**
Vulnerability Number:	CSVR-OR-ORR-05
Functional Area(s):	**Identification of Chemical Holdings**

4. **Supporting Observations.**

- **A number of the facilities visited stored large quantities of chemicals:**
  - **Industrial quantities of lithium and its compounds (Y-12 and K-25).**
  - **Beryllium and its compounds (in Building 9201-5 at Y-12).**
  - **Mercury (in Building 9201-4 at Y-12).**

- **Uranium hexafluoride is stored at a number of areas at K-25. The total amount (from the site emergency plan) is estimated at more than 50,000 tons. This material is stored in several yards, generally segregated by size of containers and contents. These yards are fenced, and access is controlled. However, these areas lack engineered controls to minimize the potential for environmental releases, and the conditions of the yards and containers are deteriorating. This has necessitated reliance on administrative controls (e.g., inspections and testing for container integrity).**
  - **Most of the containers are placed on concrete pads, with full containers set on wooden saddles. There are numerous instances, however, where saddles have deteriorated or broken and areas where concrete has deteriorated.**
  - **Many containers show evidence of excessive corrosion. A number of containers have leaked, and some may still be leaking.**
  - **The yards do not have containment or catch basins to control runoff.**

- **There have been attempts to sell some surplus material (particularly lithium compounds) on the open market. Bids received for this material have been well below market value. MMES is attempting to dispose of lithium and beryllium to commercial vendors.**

- **A definitive, long-term policy on the disposition of this excess material is lacking.**

- **See Vulnerabilities CSVR-OR-ORR-02, CSVR-OR-ORR-03, and CSVR-OR-ORR-04.**

ATTACHMENT 3

SELECTED ACRONYMS

CAS	Condition Assessment Survey
CFR	Code of Federal Regulations
D&D	Decontamination and Decommissioning
DOE	U.S. Department of Energy
EH	DOE Office of Environment, Safety and Health
HAZWOPER	Hazardous Waste Operations
MMES	Martin Marietta Energy Systems
MSDS	Material Safety Data Sheet
OR	Oak Ridge Operations Office
ORNL	Oak Ridge National Laboratory
OSHA	Occupational Safety and Health Administration
RCRA	Resource Conservation and Recovery Act of 1976
TSCA	Toxic Substance Control Act of 1976

APPENDIX F

FIELD VERIFICATION REPORT
SAVANNAH RIVER SITE
APRIL 18-26, 1994

CONTENTS

ATTACHMENTS

EXECUTIVE SUMMARY

This report presents the results of a review of chemical safety vulnerabilities associated with facilities owned or operated by the Department of Energy (DOE) at the Savannah River Site (SRS). This review is part of the Chemical Safety Vulnerability Review directed by the Secretary of Energy and being lead by the Office of Environment, Safety and Health with full participation of line organizations with operational responsibilities. The purpose of the review is to identify and characterize conditions or circumstances involving potentially hazardous chemicals at DOE sites and facilities, with emphasis on facilities being transitioned to, awaiting, or undergoing decontamination and decommissioning (D&D). Specifically, the review is designed to identify, characterize, and prioritize facility-specific and generic chemical safety vulnerabilities associated with conditions or circumstances may result in (1) fires or explosions from uncontrolled chemical reactions, (2) exposure of workers or the public to chemicals, or (3) releases of chemicals to the environment.

Activities reviewed at SRS in which hazardous chemicals were involved included laboratories, process facilities, utilities, nuclear reactors, decontamination, and waste treatment and storage facilities. Specific facilities were selected for review based on the desire to evaluate chemical hazards associated with facilities at different points in their life cycle. The facilities selected included a facility being prepared for startup, operating facilities, abandoned facilities, a facility being prepared for turnover for D&D, and a facility engaged in decommissioning activities.

The field verification team noted that the chemical safety program at SRS has made significant improvements since the DOE chemical safety oversight review was conducted in 1992. The overall chemical safety program at SRS appears to be moving in a positive direction. Management at the Westinghouse Savannah River Company (WSRC) understands the issues that must be addressed, and a concentrated effort is under way to improve problem areas. Efforts by WSRC management to “get their hands around” the implementation of a complete chemical safety program should continue. This implementation should be closely coordinated to ensure that initiatives do not become fragmented across the site. The field verification team’s greatest area of concern focused on inadequate hazards analysis for some facilities and work activities.

Chemical safety vulnerabilities represented by weaknesses or potential weaknesses were identified and are listed below in order of priority, none of which represent a condition or circumstances with the potential for severe near-term consequence:

- Some facilities and work packages are not receiving adequate hazard analysis. These conditions and circumstances represent a medium-priority vulnerability with a potential for short-term consequences.

- Knowledge about and characterization of chemical residuals at some facilities are not adequate. These conditions and circumstances represent a low- to medium-priority vulnerability with a potential for short-term consequences.

- In some cases, knowledge about chemicals and chemical inventory and the hazards communication program are not adequate. These conditions and circumstances represent a low- to medium-priority vulnerability with a potential for short-term consequences.

- WSRC lacks a fully developed and implemented chemical safety program. These conditions and circumstances represent a low-priority vulnerability with a potential for short-term consequences.

- Shifting departmental priorities are having an adverse affect on the site's overall chemical safety program. These conditions and consequences represent a low-priority vulnerability with potential for short-term consequences.

In addition, the field verification team identified several commendable practices at SRS, including the following:

- Development of an industrial hygiene program planning document,
- Use of a "blue dot" program to identify containers holding hazardous chemicals,
- Replacement of gaseous chlorine with sodium hypochlorite at water treatment facilities,
- Implementation of a chemical salvage program for reactor areas,
- Implementation of a safety observer program, and
- Exchange of information related to chemical safety with Westinghouse Hanford.

1.0 INTRODUCTION

1.1 Purpose and Scope

Based on direction from the Secretary of Energy, the Assistant Secretary for Environment, Safety and Health established the Chemical Safety Vulnerability Working Group to review and identify chemical safety vulnerabilities at facilities operated by the Department of Energy (DOE), The information obtained from the review will provide the Working Group with valuable input for identifying generic chemical safety vulnerabilities that confront the DOE complex. Prioritizing the generic chemical safety vulnerabilities that are identified will establish the proper basis for departmental focus on programs, funding, and policy decisions related to chemical safety. The Secretary directed the Office of Environment, Safety and Health to lead the review, with full participation from DOE line organizations with operational responsibilities.

The Chemical Safety Vulnerability Review was designed and undertaken to identify and characterize adverse conditions and circumstances involving potentially hazardous chemicals at facilities owned or operated by the Department. Specifically, the review was intended to identify, characterize, and prioritize chemical safety vulnerabilities associated with conditions or circumstances that might result in (1) fires or explosions from uncontrolled chemical reactions, (2) exposure of workers or the public to hazardous chemicals, or (3) release of hazardous chemicals to the environment. Using input provided by line organizations with operational responsibilities, the Working Group developed a project plan[1] to guide the review.

This report documents activities related to the field verification phase of the Chemical Safety Vulnerability Review. The field verification process was designed to use independent teams of technical professionals with expertise in a variety of technical disciplines to verify the accuracy and completeness of the data compiled during the field self-evaluation phase of the review. The field self-evaluation process used a standard question set developed and distributed by the Working Group to collect data related to chemical safety from 84 facilities located at 29 sites. Based on analysis of self-evaluation data, nine sites, including the Savannah River Site (SRS), were selected to participate in the field verification phase of the review.

The field verification team visiting SRS examined a broad range of facilities (based on facility type and operational status), with special attention given to those facilities being transferred to, awaiting, or undergoing decontamination and decommissioning (D&D). Different types of chemical- and waste-handling facilities were reviewed at SRS, including laboratories, process facilities, utilities, nuclear reactors, decontamination facilities, and waste treatment and storage facilities, to permit identification of chemical safety vulnerabilities. Facilities selected for review included a facility being prepared for startup, operating facilities, abandoned facilities, a facility being transitioned to D&D, and a facility involved with decommissioning. Specific facilities were selected for review based on the desire to review chemical hazards associated with facilities at different points in their life cycle.

---

[1] "Project Plan for the Chemical **Safety Vulnerability Review," dated March 14, 1994.**

The field verification team, under direction of a DOE team leader, was composed of DOE and contractor personnel with technical expertise in various aspects of chemical safety, including management, operations, training, chemical process safety, industrial hygiene, maintenance, environmental protection, and emergency preparedness. A team composition list is provided in Attachment 1 of this appendix.

The team met with management or technical representatives from DOE and contractor organizations. Individual and small group meetings were also held, and team members conducted walkthroughs, document reviews, and personnel interviews to gather information related to potential chemical vulnerabilities at SRS. The team leader met daily with management personnel to discuss the team's activities and issues that may have surfaced during the previous day. Before the field verification team left SRS, management from local DOE and contractor organizations conducted a factual accuracy review of the draft report. An outbriefing was conducted for DOE and contractor management on Tuesday, April 26, 1994. A draft copy of this report was left with DOE and contractor management.

1.2 **Site Description**

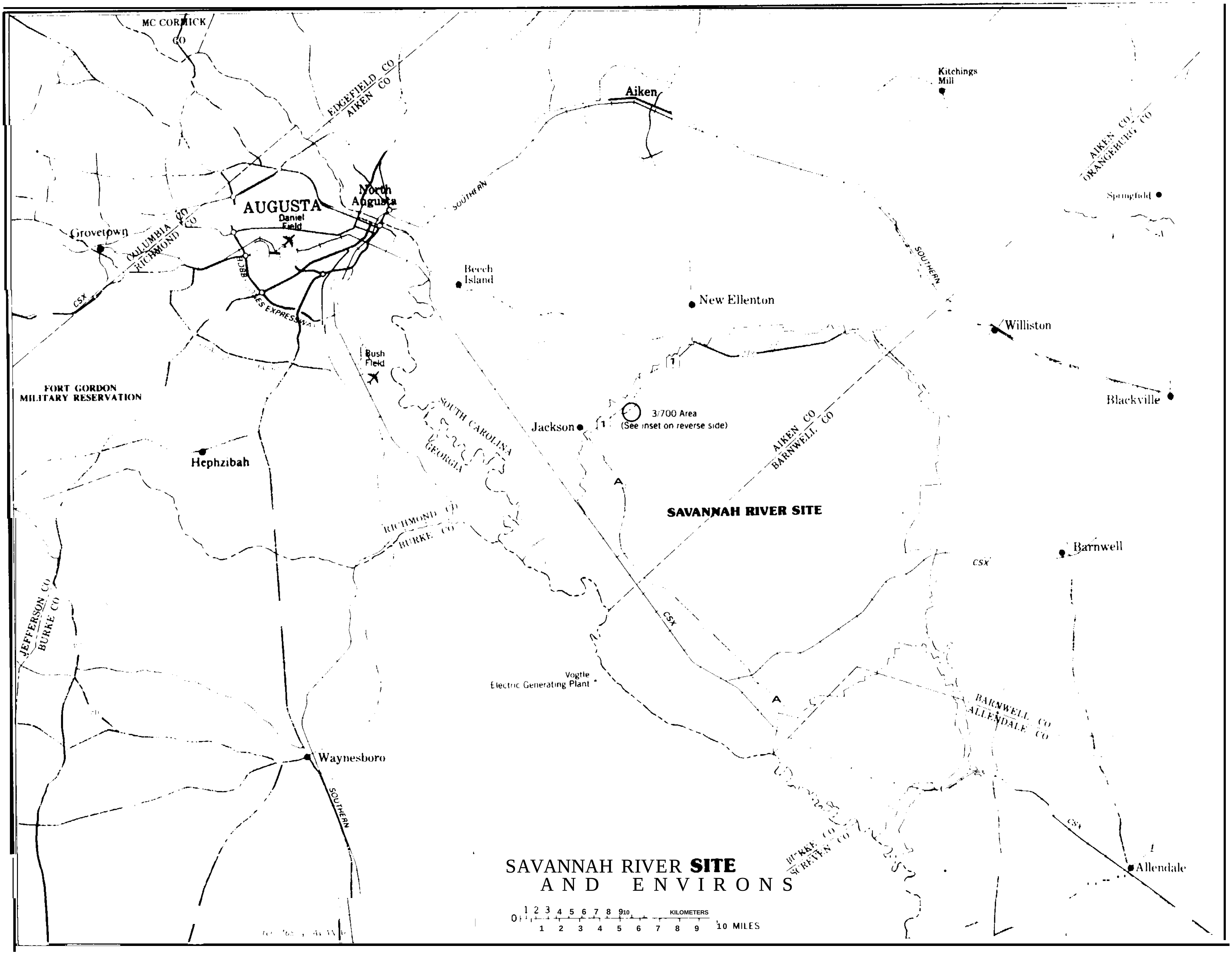
The SRS occupies an area of about 300 square miles adjacent to the Savannah River, principally in Aiken and Barnwell Counties of South Carolina, and about 25 miles southeast of Augusta, Georgia. SRS has been operated for the DOE by the Westinghouse Savannah River Company (WSRC) since April 1989. SRS has produced plutonium, tritium, and other special nuclear materials for national defense. SRS has also produced nuclear materials for other Government and civilian purposes. (See figures that follow.)

SRS is composed of six major production areas in which a variety of hazardous chemicals and wastes are located and used, including reactor areas, separation areas, waste management areas, the Heavy Water Reprocessing Area and powerhouses, the Reactor Materials Area, and the Administration Area.

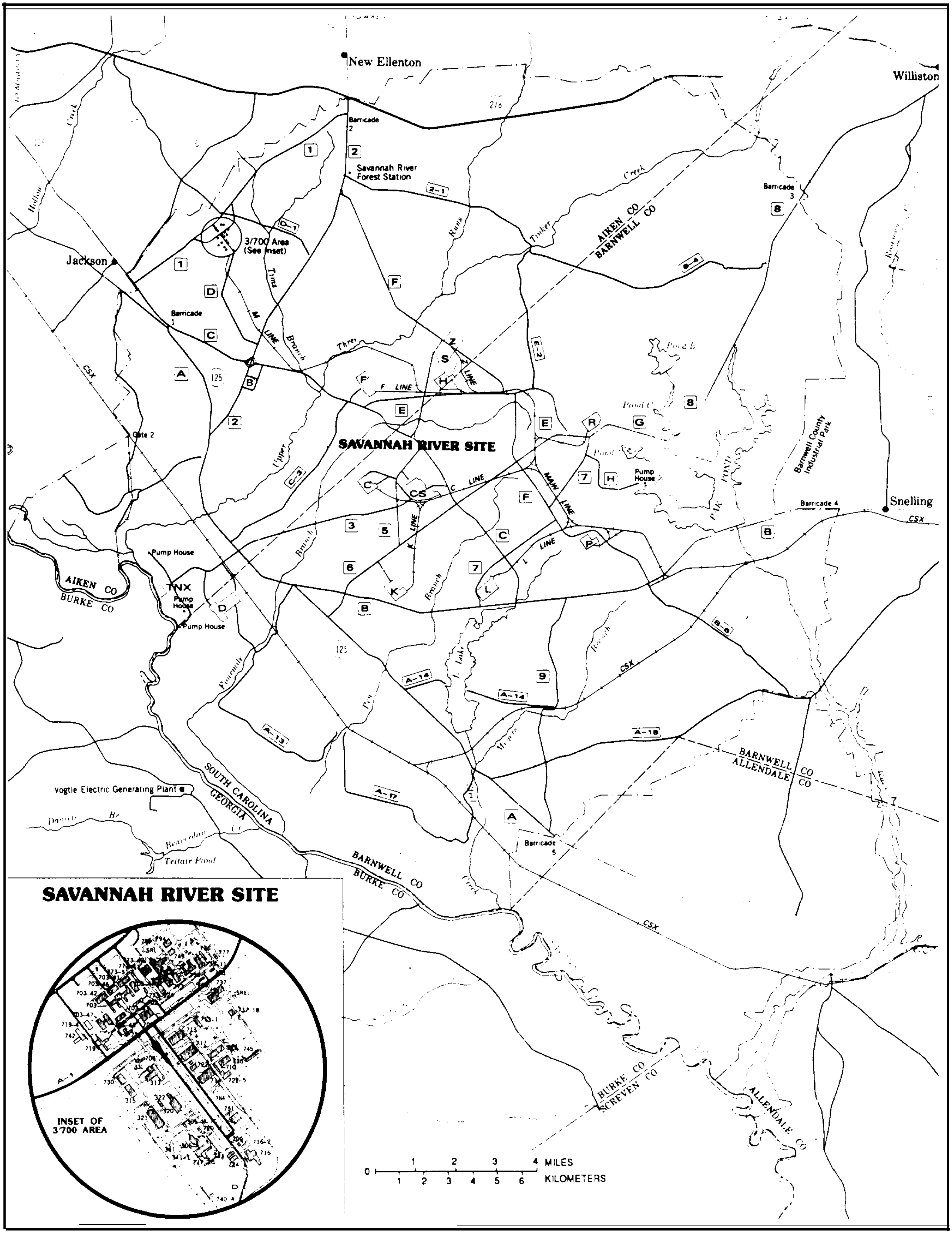
1.3 **Facilities Visited**

Because visiting every facility at the site was not possible under the constraints of this review, the Working Group focused its efforts to achieve the maximum results possible in the time available. Six facilities at SRS were selected to participate in the self-evaluation phase of the chemical safety vulnerability review. The intent of the team was to verify the self-evaluation data for those facilities participating in that phase. Based on detailed analysis of the self-evaluation data, it was determined that insufficient chemical hazards existed to warrant verification at one facility. Two additional facilities were determined to need only a cursory visit to verify data. To allow the team the opportunity to review a variety of chemical hazards at SRS, eight additional facilities were visited during the verification effort. Some of the added facilities received only a brief review. Facilities that were reviewed by the field verification team at SRS included the following:

L Reactor and P Reactor: L Reactor and P Reactor are two of five reactors placed in service during 1953-5. These nuclear reactors operated at low pressure and were moderated and cooled by heavy water. Secondary cooling was provided by water from the Savannah River. The reactors are housed in buildings heavily shielded with concrete to protect



MC CORMICK CO
EDGEFIELD CO
AIKEN CO
Aiken
Kitchings Mill
AIKEN CO
ORANGEBURG CO
Springfield
AUGUSTA
North Augusta
Daniel Field
SOUTHERN
Grovetown
COLUMBIA CO
RICHMOND CO
CSX
Beech Island
New Ellenton
Williston
Bush Field
FORT GORDON MILITARY RESERVATION
Blackville
3/700 Area
(See inset on reverse side)
Jackson
SOUTH CAROLINA
GEORGIA
Hephzibah
AIKEN CO
BARNWELL CO
SAVANNAH RIVER SITE
RICHMOND CO
BURKE CO
Barnwell
CSX
JEFFERSON CO
BURKE CO
Vogtle Electric Generating Plant
BARNWELL CO
ALLENDALE CO
Waynesboro
SOUTHERN
BURKE CO
SCREVEN CO
Allendale
SAVANNAH RIVER SITE
AND ENVIRONS
KILOMETERS
10 MILES



SAVANNAH RIVER SITE
New Ellenton
Williston
Jackson
Snelling
Barricade 1
Barricade 2
Barricade 3
Barricade 4
Barricade 5
Savannah River Forest Station
3/700 Area (See inset)
AIKEN CO
BARNWELL CO
BURKE CO
ALLENDALE CO
SCREVEN CO
SOUTH CAROLINA
GEORGIA
CSX
Gate 2
Pump House
TNX
Vogtle Electric Generating Plant
Barnwell County Industrial Park
MAIN LINE
F LINE
C LINE
K LINE
L LINE
Teltair Pond
INSET OF 3/700 AREA
0 1 2 3 4 MILES
1 2 3 4 5 6 KILOMETERS

personnel from radiation exposure. Irradiated assemblies were discharged from the reactors to the fuel and target storage basin and eventually sent to Separations and Tritium for processing. L Reactor was taken out of service in 1968 and placed back in service in 1985. Both L and P Reactors were taken out of service in 1988 and have been placed in shutdown mode.

184-P Powerhouse: The 184-P Powerhouse is a coal-burning powerhouse with two stoker boilers. It provided power and steam to the P Reactor Area. This powerhouse was taken out of service in 1990 and is now abandoned.

315-M Essential Materials Storage: This building is a storage (and former receiving) area for essential materials used in the 300 Area. Before distribution and use in the 300 Area processes, essential materials are inspected and approved. The inspection equipment, methods of inspection, maintenance of stock and inventory records, and the routine operations are described in administrative procedures.

316-M Mixed-Waste Storage Shed: Building 316-M is considered part of the mixed waste storage shed (MWSS). This building is a covered shed structure with a concrete base and is surrounded by security fencing. The MWSS is used primarily for the storage of 55-gallon drums, but can also receive 90-cubic-foot boxes or special containers. The total capacity of drums and boxes combined shall not exceed the capacity equivalent to 560 55-five gallon drums. The types of wastes currently stored are FOO6 filterpaper and filtercake, DO02/DO09 plating line solutions, F-listed solvent rags, toxicity characteristic leachate procedure (TCLP) wastes (DOO04-D043), DOOO1 ignitable, and DO03 corrosive wastes. Some of this material is considered “mixed” waste because it is listed as a hazardous waste and is also radioactive.

320-M **Analytical Laboratory:** The 320-M Analytical Laboratory previously supported the 300-M Area Reactor Materials Production plants. Today, in the absence of 300-M Area production activities, it provides analytical services for several departments. Its future is being evaluated.

483-D Chlorination Facility: The chlorination facility previously used gaseous chlorine to chlorinate water in 400-D Area for use in process and domestic water systems. Chlorination prevents biofouling in water plant precipitators and filters, and provides residual chlorine in domestic water. The site initiated efforts in early 1993 to replace gaseous chlorine, and liquid sodium hypochlorite has replaced the gaseous chlorine.

717-9 P Excess Chemicals Facility: The excess chemicals facility was recently established. Excess chemicals from all the reactor areas were brought to this facility for reissue or other disposition. The facility will be used as a clearinghouse for excess chemicals at SRS.

412-D Heavy Water Extraction Facility: The heavy water extraction facility was an isotope exchange process that used the Girdler-Sulfide process to concentrate deuterium. The Girdler-Sulfide process used hydrogen sulfide as a circulating carrier to transport deuterium from hot to cold water in successive stages. This facility in undergoing partial D&D.

H Area High-Level Waste Tank Farm: The tank farm is composed of 29 waste tanks, ranging in volume from 750,000 to 1,300,000 gallons, and two evaporators. Four tanks are used for pretreatment of salt for vitrification, and three are used for pretreatment of sludge. High-1evel waste is transferred to the tank farm from the 221-H Separations Canyon Facility. Waste is aged in the tanks to allow short-lived radionuclide decay and phase separation. On separation, the aqueous phase is evaporated to reduce volume and mobility. This is an operating facility.

241-96 H In-Tank Precipitation Facility: The In-Tank Precipitation (ITP) Facility treats and separates radioactive salt solutions into two waste streams, a decontaminated salt solution and a concentrated precipitate slurry. ITP consists of four H Area Tank Farm tanks, a large crossflow filter, and two benzene stripper columns. The slurry is transferred to the Defense Waste Processing Facility for vitrification and the decontaminated salt solution is transferred to the Salt Stone Grouting Facility for solidification. This facility is being prepared for startup.

299-H High-Level Waste Maintenance Facility: The High-Level Waste Maintenance Facility is used for the decontamination, and subsequent repair, of contaminated and/or failed equipment. The facility has a 1,680-gallon waste collection tank for mixed waste. This is an operating facility.

F Area Concentrate Transfer System: The F Area Concentrate Transfer System is an 11 ,700-gallon tank that was used to collect concentrated waste from the 242-F Area Evaporator transfer lines. This system allows concentrate to be directed to any of three receipt waste tanks. The system also contains pumps needed to move the concentrate through the transfer lines. This facility is in inactive shutdown.

2.0 SUMMARY OF RESULTS

The field verification process was designed to use independent teams of safety professionals to verify the accuracy and completeness of the data provided to the Chemical Safety Vulnerability Working Group by SRS facilities selected to participate in the field self-evaluation process. The verification process offered an opportunity to examine potential chemical safety vulnerabilities and to make informed judgments about the seriousness of these conditions.

The goal of the field verification visit was to develop a prioritized list of chemical safety vulnerabilities at SRS. Before arriving on site, the team reviewed the self-evaluation data and other documents to allow team members to develop a list of observations related to potential vulnerabilities for their functional areas. During the onsite portion of the review, team members visited the facilities that participated in the self-evaluation effort to verify reported observations and to look for other conditions and circumstances that may result in chemical safety vulnerabilities. In some instances, facilities or areas that were not involved in the original self-evaluation were also reviewed and have provided valuable information for the review.

To support effective team management and to expedite the identification of vulnerabilities across a wide range of technical disciplines associated with chemical safety, each field verification review has been organized to include five functional areas:

- Identification of chemical holdings, including the properties of chemicals located at the facility, the characterization of those chemicals, and an analysis of the inventory.

- FacilityP hysical condition, including engineered barriers, maintenance conditions, chemical systems, safety systems, storage, monitoring systems, and hazards identification.

- Operational control and management systems, including organizational structure; requirements identification; hazard analysis; procedural adherence; maintenance control; engineering and design reviews; configuration control; safe shutdown plans; and site programs for quality assurance, chemical safety, inventory control, access control, disposal, transportation and packaging, and corrective actions.

- Human resource programs, including technical competence, staffing, training and qualifications, employee involvement, employee concerns, personnel performance requirements, and visitor and subcontractor control.

- Emergency management program, including the emergency response plan, in-plant consequences, environmental issues, coordination with the community, and community right-to-know issues.

These functional areas were evaluated on the basis of lines of inquiry provided in Attachment 1 of the “Field Verification Guide for the Chemical Safety Vulnerability Review,” dated April 8, 1994. Verification of the self-evaluation data was accomplished by walkthrough of facilities, conduct of interviews with management and technical personnel, examination of facility and site documentation, and review of incident reports and other documents. Summaries of the functional areas are provided in the sections below.

Five vulnerabilities were identified as a result of the SRS field verification: (1) some facilities and work packages are not receiving adequate hazards analysis; (2) knowledge about and characterization of chemical residuals at some facilities is not adequate; (3) in some cases, knowledge about chemical inventory and the hazards communication program is not adequate; (4) WSRC lacks a fully developed and implemented chemical safety program; and (5) shifting departmental priorities are having an adverse effect on the site's overall chemical safety program.

Commendable practices identified related to chemical safety at SRS include (1) development of an industrial hygiene planning document, (2) use of a "blue dot" program to identify containers with hazardous chemicals, (3) replacement of gaseous chlorine with sodium hypochlorite at water treatment facilities, (4) implementation of a chemical salvage program at reactor areas, (5) implementation of a safety program, and (6) exchange of information related to chemical safety with Westinghouse Hanford.

Overall, it was the field verification team's opinion that the SRS self-evaluation document provided a fair and thorough representation of conditions at the facilities reviewed. Several minor inconsistencies in the self-evaluation were resolved between the field verification team and WSRC. With help from SR and WSRC personnel, the field verification team was able to provide additional insights on chemical safety vulnerabilities at SRS. The following sections summarize the field verification team's understanding of chemical safety programs at SRS. Where applicable, specific chemical safety vulnerabilities are referenced. Completed vulnerability forms are provided in Attachment 2 of this appendix.

2.1 Identification of Chemical Holdings

Storage practices for process chemicals in facilities visited at SRS appeared to be appropriate. One concern exists regarding the storage of large amounts of sodium tetraphenylborate, which is a marginally stable solution used in high-level waste processing, at the In-Tank Precipitation Facility. Chemical residuals were identified in several older facilities awaiting or involved with D&D type activities. However, procedures for flushing line and process vessels in newer facilities should minimize residues in the future. Observed storage practices for hazardous chemical wastes were good, and a recently started salvage program should further reduce those holdings. There is, however, no management program that tracks hazardous chemicals throughout their existence at SRS.

For the areas reviewed, chemical inventories varied from essentially zero for some inactive facilities to large storage tanks for caustic acids and liquid nitrogen at some operating facilities or facilities being prepared for startup. Systems to support safe holdings of these process chemicals were in order. In most cases, the inventories were appropriate for the activity being performed. At the In-Tank Precipitation Facility, an evaluation is being performed to determine whether the onsite quantity of a benzene-emitting material (sodium tetraphenylborate) can be brought into the facility on an as-needed basis instead of maintaining a large amount (up to 188,000 gallons) of the solution, which could degrade excessively with time and temperature. Additional concerns about use of this chemical have been raised recently because of a drum overpressurization at the vendor's facility due to unexpectedly rapid benzene emission from solid sodium tetraphenylborate. The overpressurization occurred shortly after dehydrating an aged batch of solution and was triggered by trace impurities. This situation prompted WSRC

to perform additional studies on the safe handling and use of sodium tetraphenylborate. Although the final decision has not been made regarding receiving and holding this chemical, it is evident that minimizing the inventory of this marginally stable compound should reduce the vulnerability associated with personnel and property exposure to benzene, which is carcinogenic (see Vulnerability CSVR-SRS-OOO-O1).

Operating personnel stated that, on completing a production run, lines are flushed or gravity precludes accumulation of process chemicals or residues in those lines; for example, this practice was defined as part of the procedure for decontaminating equipment in the 299-H High Level Waste Maintenance Facility. Some process residues that cause concern remain in inactive facilities undergoing or awaiting D&D-type activities (see Vulnerability CSVR-SRS-OOO-O1). Most residues are minor, but some (e.g., a tarlike substance with a pH of 1 at the 412-D Heavy Water Extraction facility column) remain uncharacterized. In addition, sulfate coatings on the interior of processing lines at the 412-D facility have proven to be a health threat in that a worker appeared to have inhaled noxious gas after the high temperature cutting of one of the pipes. Although site work control does require hazards assessment, the inhalation event occurred on November 11, 1993, and the procedure used in this activity has not been updated (as of April 22, 1994) to ensure appropriate technical reviews will be performed before cutting into pipes or vessels that could contain process chemical residues (see Vulnerability CSVR-SRS-OOO-02).

Chemical inventories were controlled, but there is no management program in some facilities to track chemicals from the time they are brought on site until they are used or properly disposed. The Reactor Division operates a formal Chemical Salvage program to reduce chemical inventories, but it is not part of any sitewide system. Through this program, abandoned (e.g., cleaning products) and unwanted or unneeded chemicals are recycled. in addition, onsite inventories of chemicals are reduced and, in many cases, requirements for waste disposal are reduced. The storage of hazardous liquid and solid waste in these facilities was performed in a well-controlled and safe manner.

2.2 **Facility Physical Condition**

For the facilities reviewed at SRS, the mechanical integrity of the primary and secondary containment systems and the equipment for handling hazardous chemicals was determined to be good, even when age and operating status of the facilities were considered. The mechanical integrity of pressure vessels, boilers, and process piping at SRS is closely monitored by maintenance and operations personnel with support from several engineering committees including, but not limited to, the Pressure Protection Committee and the newly formed Piping Committee. Maintenance management systems are in place to minimize the potential of change in system function as a result of maintenance activities.

The site Pressure Protection Committee coordinates activities related to the original and continued adequacy of pressure vessels and pressure relief devices. Pressure vessels and boiler external piping are ultrasonically tested on a schedule based on how crucial the system is to site operations and the severity of the consequences of vessel failure. During 1993, an employee received second degree bums from concentrated sulfuric acid spray when a 1-inch-diameter line (not previously inspected) failed. A multidisciplinary piping committee was chaired, assembled, and funded in 1994 to determine the inspection requirements for nuclear safety and critical protection equipment, including piping. Five facilities have been selected for detailed piping inspection using applicable ultrasonic, radiographic, or one of several surface inspection techniques during the next 12 months. Piping inspection activities are expected to expand, as warranted, sitewide. When containment systems must be breached, formal written procedures must be approved by the Cognizant Systems Engineer. A safety review and a quality assurance review of all procedures are required.

A work control program is in place defining preventive and mitigative measures for nonroutine work activities. For example, the Work Clearance Permit authorizes personnel to begin work once signatures on the permit indicate all work groups are satisfied that (1) equipment and area have been prepared for the assigned work, (2) necessary safety precautions have been taken, and (3) regulatory permits have been received.

Engineering design safeguards to promote worker safety are included in facility design or modification. Health and safety personnel interface with engineering design personnel during project review with the intent being to ensure all safety and health issues have been addressed. Depending on the severity of the consequences of failure, design authority approval requires a process hazards review, safety analysis report, unreviewed safety question determination, and/or a hazards assessment document with each facility design or modification package.

The Chemical Safety Oversight Review (dated November 1992) indicated that the chlorine storage facilities, in the 400 D Area and at the 5-G Pumphouse, were high-risk facilities because of the quantity of gaseous chlorine stored on site and the proximity of both facilities to the site boundary. As a result, water treatment with gaseous chlorine has been replaced by treatment with liquid sodium hypochlorite, and chlorine cylinders have been returned to the supplier. Gaseous chlorine is no longer a chemical safety vulnerability at SRS.

The reduction in maintenance staff through budget reduction, personnel transfer, retirement, and facility shutdown will continue to result in loss of experienced personnel who have intimate knowledge of unrecorded aspects of first generation facilities. Such information could prove invaluable during D&D activities. This loss of experience level has the potential to adversely affect the site’s chemical safety program (see Vulnerability CSVR-SRS-OOO-05).

2.3 **Operational Control and Management Systems**

WSRC management has recognized those areas where systems and programs are needed to promote chemical safety at SRS and has established several programs that collectively support chemical safety. WSRC is developing and implementing other management initiatives and improvements related to chemical safety, such as the recently approved Chemicals Commodities Management Center, but progress has been hampered by a fragmented approach and the lack of central program direction. Until these systems are in place, SRS will not have an effective overall chemical safety program. In some cases, the effectiveness of the present chemical safety program is diminished by lack of thorough industrial hygiene review of work packages for job hazards analysis. Other factors leading to weaknesses are a DOE-imposed accelerated schedule for transition of surplus facilities and a site welding and cutting manual that has not been revised to reflect the need for technical assessment of potential internal contaminants in pipes and vessels.

WSRC has initiated several management systems and programs to address certain elements of a sitewide chemical safety program, For example, Process Hazards Reviews are performed to identify, prevent, mitigate, or control chemical hazards for all new processes or process modifications involving chemicals in quantities greater than those designated as Immediately Dangerous to Life and Health. Other management tools, such as the lessons-learned program and the WSRC performance appraisal system, require only minor changes to support chemical safety more fully at SRS.

Several important management tools and systems that are not in place or fully implemented but have been recognized by WSRC as required include: (1) a sitewide system for procuring, managing, controlling, tracking, and disposing of hazardous chemicals; (2) configuration management of processes, equipment, and facilities involving hazardous chemicals; (3) a Process Safety Management (PSM) Program as defined in 29 CFR 1910.1 19; and (4) a program that defines the requirements for transition of surplus facilities from program offices to the Office Facility Transition and Management (EM-60) and that incorporates the need for characterization of chemical residues. In all of these cases, WSRC has plans or initiatives under way (e.g., the Chemical Commodities Management Center concept). Lack of sitewide direction has resulted in fragmented initiatives across SRS, and even though these initiatives are under way, they represent a vulnerability until they are fully implemented (see Vulnerability **CSVR-SRS-OOO-04).**

The WSRC Occupational Safety and Hygiene Department has implemented a comprehensive industrial hygiene hazard assessment program. Procedures for program compliance are in place but not always effective. The Hazard Implementation and Control Program ensures that potential employee exposures to hazardous chemicals are reviewed. Industrial hygiene baseline assessments have been completed for all operations areas having potential occupational health hazards. In addition to their other duties, some members of the industrial hygiene staff review as many as 50 work packages per week. At times, pressure is exerted on the department by work-package originators to provide a quick turnaround of work packages. As D&D activity increases, this problem will increase. In addition, industrial hygiene staff are not always requested to participate in the pre-bid phase (to review planned work) **for subcontractors.** As a **result of these factors, industrial hygiene review of internal work packages may not always provide for a complete or consistent job hazards analysis** before work is started (see Vulnerability CSVR-SRS-OOO-03).

Safety documentation (safety analysis reports, justifications for continued operation, and safety assessments) was reviewed for two facilities. Both were appropriate for the hazards involved. No discernable, unidentified chemical vulnerabilities were found as a result of these document reviews. However, the degradation of the sodium tetraphenylborate solution to benzene under storage conditions raises questions about maintaining large quantities of tetraphenylborate solutions onsite (see Vulnerability CSVR-SRS-OOO-O1).

Approved procedures are in place to control onsite transfer of hazardous chemicals and hazardous chemical wastes. The Hazardous Materials Transfer Representative Program is in place to assist operations personnel with nonroutine hazardous chemicals transfers. No vulnerabilities were identified in the area of packaging and onsite transfer of hazardous chemicals.

Neither of the site welding manuals identifies the need for technical assessment of any potential internal chemical contaminants that could be encountered during a welder cutting or welding of pipes or vessels. The requirement has not been incorporated into either manual, even though an incident involving the 412-D Heavy Water Extraction Facility incident occurred 6-months ago (see Vulnerabilities CSVR-SRS-OOO-OI, CSVR-SRS-OOO-02, and **CSVR-SRS-OOO-03).**

WSRC has established a decommissioning policy defining the actions to transition surplus facilities from operating status to D&D. This policy includes requirements for the development of a facility transition plan, the characterization of facilities for chemical residues, and the surveillance and maintenance of facilities. All requirements of the decommissioning policy have not been implemented at SRS. Thus, detailed requirements are not in place for transfer of shutdown facilities to EM-60. WSRC had expected to have a fully implemented decommissioning program in place in about 18 months, However, recent direction from DOE Headquarters has accelerated this program (i.e., within the next 6 months). Lack of sufficient resources for this accelerated effort and the accelerated schedule for implementing this program may contribute to a weakness in that insufficient implementation time and funds may not permit proper planning for and characterization of chemical hazards before transfer of facilities EM-60 (see Vulnerabilities CSVR-SRS-OOO-02, CSVR-SRS-OOO-03, and **CSVR-SRS-OOO-04).**

2.4 Human Resource Programs

In general, WSRC has developed extensive and well-defined environment, safety, and health (ES&H) training programs that include both general chemical safety awareness and hazards associated with chemical process safety. However, concerns exist about control of employee access to facilities and, in some areas, definition of training needs.

Various types of on-the-job and classroom training that relate to chemical safety and hazard recognition are conducted at SRS. All DOE and contractor personnel are required to complete a 4-hour general employee training (GET) course. This course satisfies the general training requirements for information, safety, and emergency management common across all SRS facilities. WSRC conducts facility-specific orientation training within each major facility on site to provide employees with additional information regarding facility-specific hazards. Job-specific training is also provided, as needed, to conduct operations safely.

With the exception of job-specific (operations, maintenance, and technical) courses, training on chemical hazards and chemical hazards recognition is conducted within the facility-specific training or hazard communication (HAZCOM) courses. This training is appropriate and well administered at SRS. However, completion of facility-specific training or HAZCOM training is not verified consistently before DOE, contractor, and subcontractor personnel are granted access to areas where chemical hazards exist. Tritium and HB-Line are the only SRS facilities that restrict access to personnel who have not completed the requisite facility-specific training. Access is controlled through issuance of a proximity badge. The badge was originally developed to restrict personnel access for security reasons, but the process is being used effectively by these facilities as an administrate control to limit access to properly trained personnel. No other facilities at SRS, including the High-Level Waste Tank Farms, the In-Tank Precipitation Facility, and the Defense Waste Processing Facility, control access in this manner (see Vulnerability CSVR-SRS-OOO-04).

Effective and viable hazardous waste operations and emergency response (HAZWOPER), HAZCOM, and hazardous materials (HAZMAT) training is provided at SRS. HAZWOPER training is required by WSRC procedures for employees (typically hazardous waste workers) likely to be exposed to hazards while in Resource Conservation and Recovery Act (RCRA) regulated treatment, storage, and disposal (TSD) facilities, but other TSD workers and visitors, who are considered “not likely to be exposed” to hazards, are not required to complete HAZWOPER training and are not required to be escorted by HAZWOPER-trained personnel. Since training of these employees is not reviewed as part of access control at TSD facilities (nor in many other areas where significant chemical hazards are present), the sole administrative burden of ensuring that applicable training is complete and current is being placed on supervisors and individual employees.

Additional job-specific chemical process safety training is provided to personnel who have a higher risk of exposure to hazardous chemicals. Training for operations, maintenance, and technical contractor and subcontractor personnel is designed to ensure that ongoing operations and facilities startup are conducted safely. However, training for many positions at SRS is not consistently defined or controlled. Although training requirements and associated qualification cards are well defined in many areas, most notably in new facilities entering startup and responding to concerns identified during Operational Readiness Reviews and by the Defense Nuclear Facilities Safety Board, training requirements for job positions in some facilities and departments are not as comprehensive nor as well controlled. In addition, the use of comprehensive qualification testing to verify the effectiveness of worker training is inconsistent across the site. The Training Records and Information Network (TRAIN) data base is used to document training that has been completed by employees, but consistent sitewide use of the data base as a training requirements tool has not been fully achieved (see Vulnerability CSVR-SRS-OOO-04).

Staffing levels to provide ES&H training are adequate. Staffing levels also appear adequate to enable workers to perform work safely in work areas where chemical hazards are present. Employee involvement is encouraged through effective DOE and contractor employee concerns programs. Chemical safety concerns or issues raised by SRS employees (typically involving workers concerned about their safety while working with or around hazardous chemicals) have been investigated and appropriately closed.

2.5 Emergency Management Program

The emergency management program supports chemical safety at SRS and is improving in the area of preparation for chemical emergencies. Facility-specific emergency planning related to chemical safety is also improving. One major area of weakness was identified related to chemical emergency preparedness—that is, inadequate and incomplete chemical safety analysis and hazards analysis information (see Vulnerability CVSR-SRS-OOO-O1).

Many significant improvements in chemical emergency management have occurred at SRS since the Chemical Safety Oversight Review was conducted in 1992, More emphasis is now given to chemical emergencies in exercises and drills. Both facility-specific and sitewide hazardous chemical emergency drills are being conducted. Some chemical emergency action levels have been developed, and the classification matrix includes a general initiating condition categorized as “toxic chemical release.” Coordination with offsite authorities and organizations is increasing; 13 letters of agreement for offsite support exist at present, and development of an additional agreement is in progress. Onsite HAZMAT training is offered and provided to offsite HAZMAT support organizations that might respond to onsite emergencies. Training in hazardous materials emergency response that meets the requirements of 29 CFR 1910.120, “Hazardous Waste Operations and Emergency Response,” is provided to selected area emergency response personnel.

The Weather Information and Display System is available in area control rooms and the Dose Assessment Center and is used as an aid in protective action decision making when the incident involves an actual or potential release of hazardous material to the environment.

A technical advisor from the Industrial Hygiene Department is being assigned to the staff of the Incident Command Post to provide additional chemical expertise to support the Fire Department HAZMAT Team during responses to hazardous chemical emergencies. General employee training and job performance brochures have been developed and distributed to fit into a wallet or badge holder and to contain emergency response information specific to major areas of the site. These pocket brochures include the National Fire Protection Association chemical hazards recognition symbols/ratings. These items are recognized by the review team as general employee training, emergency preparedness, and “good management practices” for chemical safety.

One area of weakness was determined; the emergency management program is based on inadequate chemical safety analysis and hazards analysis information for emergency planning purposes (see Vulnerability CVSR-SRS-000-01). Some safety documents with information related to chemical safety, such as safety analysis reports, have not been updated for about 10 years. Emergency planning at SRS includes measures to account for the lack of complete facility chemical safety analyses. Information from chemical safety and hazard analyses is a basis for developing emergency preparedness plans and procedures. Upgraded chemical safety and hazards analyses are just beginning to be developed for nonnuclear facilities and are incomplete. Without complete chemical safety analysis and hazards analysis information, the adequacy of emergency planning zones cannot be confirmed; emergency classification recognition criteria and emergency action levels cannot be fully developed; and protective actions for employees, the public, and the environment cannot be definitively assessed.

3.0 CATEGORIZATION AND PRIORITIZATION OF VULNERABILITIES

3.1 Criteria

A vulnerability is defined as a weakness or potential weakness involving hazardous chemicals that could result in a threat to the environment, the public, or worker health and safety. Vulnerabilities can be characterized by physical or programmatic conditions associated with uncertainties, acknowledged deficiencies, and/or unacknowledged deficiencies in the area of chemical safety. Conditions required to create the vulnerability should either currently exist or be reasonably expected to exist in the future based on degradation of systems and chemicals or through expected actions (i.e., D&D of facility).

A vulnerability will be determined to exist if current or expected future conditions or weaknesses could result in the following:

- The death of or serious physical harm[2] to a worker or a member of the public or continuous exposure of a worker or member of the public to levels of hazardous chemicals above hazardous limits; or

- Environmental impacts through the release of hazardous chemical above established limits.

Prioritization of the chemical safety vulnerabilities is based on the professional judgment of team members concerning the immediacy of the potential consequences posed by a vulnerability and on the potential severity of those consequences. The first step in the prioritization process was to group vulnerabilities according to the timeframe in which they are expected to produce consequences. The following categories have been established for the timeframe within which the consequences are expected to occur:

- Immediate — Any chemical safety vulnerability that could result in immediate consequences.

- Short-Term — Any chemical safety vulnerability at a facility in which there is a significant chance of a consequence occurring within a 3-year timeframe as a result of chemical degradation, change in mission for the facility, degradation of the containment systems, change in personnel at the facility, or other factors affecting the facility.

- Medium-Term — Any chemical safety vulnerability at a facility in which there is a significant chance of a consequence occurring within a 3–1 O-year timeframe as a result of chemical degradation, change in mission for the facilitv, degradation of the containment systems, change in personnel at the facility, or other factors affecting the facility.

---

[2] Serious physical harm is defined as impairment of the body, leaving part of the body functionally useless or substantially reducing efficiency on or off the job.

- Lena-Term — Any chemical safety vulnerability at a facility in which there is a significant chance of a consequence occurring within a timeframe of more than 10 years as a result of chemical degradation, change in mission for the facility, degradation of the containment systems, change in personnel at the facility, or other factors affecting the facility.

Vulnerabilities within each category should be further prioritized to specify "high," "medium," or "low" priority based on the severity of the potential consequences. Examples of the second level of prioritization include the following:

- Prioritize potential harm to workers or the public according to the possible level of injury and/or health effect, ranging from transient reversible illness or injury to death.

- Prioritize environmental impacts based on the level of irreversible damage and/or restoration costs.

3.2 **Chemical Safety Vulnerabilities at Savannah River Site**

Five vulnerabilities were identified during the field verification review at SRS. They were prioritized in accordance with the protocol stipulated in the project plan.[3] The prioritization process considered both the timeframe in which the vulnerabilities could possibly produce consequences and the potential severity of the consequences. The team determined that one of the vulnerabilities should be considered to have short-term consequences, with the other four having immediate consequences. The potential severity of consequences ranged from low to medium for the five vulnerabilities. The chemical safety vulnerabilities identified at SRS are discussed below in order of priority, highest priority first.

CSVR-SRS-000-01: Some facilities and work packages are not receiving adequate hazards analysis.

In some cases, the chemical safety and hazard analyses for work planning and emergency response are not complete or adequate. Thorough hazards analysis review for chemical safety as it relates to D&D-type activities is not always accomplished, as demonstrated by a recent incident at the 412-D Heavy Water Extraction Facility. Pressure to complete work package reviews and lack of consistent involvement by industrial hygienists in the pre-bid phase for subcontractors have resulted in reviews of work packages that are not always thorough or complete. The emergency management program is based on inadequate chemical safety analysis and hazards analysis information. Safety analysis documentation, which includes chemical safety and hazards analyses, has not been upgraded for all (including nonnuclear) facilities at SRS. This results in the potential lack of analysis for accident scenarios related to chemicals and chemical processes. These conditions and circumstances and represent a medium-priority vulnerability with potential for short-term consequences.

---

[3] "Project Plan for the Chemical Safety Vulnerability Review," dated March 14, 1994.

CSVR-SRS-OOO-02: Knowledge about and characterization of chemical residuals at some facilities are not adequate.

Knowledge about and characterization of chemical residuals are not adequate at some facilities being transitioned to or undergoing D&D-type activities. A program to formalize requirements for transition of surplus facilities from program offices to EM-60, which includes a requirement for characterization of residuals, is under development but is not in place at SRS. Hazards analysis performed to assess the effect of chemical residuals on worker safety for the 412-D facility was not adequate. These conditions and circumstances represent a low- to medium-priority vulnerability with potential for short-term consequences.

CSVR-SRS-OOO-03: In some cases, knowledge about chemicals and chemical inventory and the hazards communication program are not adequate.

Important information relevant to chemical safety is not always communicated to workers or management. Although WSRC has implemented a comprehensive hazards communications program, exceptions were found in the areas of labelling, availability of material safety data sheets, and chemical storage. The current WSRC lessons-learned program provided useful information to management and operations personnel but does not specifically highlight chemical safety information. There is no central, real-time system to track and provide information on extremely hazardous chemicals from procurement to final disposition. These conditions and circumstances represent a low- to medium-priority vulnerability with a potential for short-term consequences.

CSVR-SRS-OOO-04: WSRC lacks a fully developed and implemented chemical safety program.

WSRC management systems for chemical safety are not fully implemented, and no overall program is in place for the entire site. This situation arises, in part, from chemical safety requirements being spread throughout multiple DOE Orders. WSRC recognizes the need to implement the programs necessary to support chemical safety. Initiatives are under way to meet site needs, such as the Chemical Commodities Management Center and the Surplus Facilities Transition Program. Until these management systems are developed and implemented uniformly across the site, the effective management and control of hazardous chemicals at SRS will remain diminished. These conditions and circumstances represent a low-priority vulnerability with a potential for short-term consequences.

CSVR-SRS-OOO-05: Shifting departmental priorities are having an adverse affect on the site's overall chemical safety program.

Change of departmental missions is resulting in situations where workers are being shifted from production work in facilities they are familiar with to cleanup work in less familiar surroundings. Poor configuration management practices of the past have resulted in **less-than** adequate documentation of chemical residuals at some older facilities. Information related to chemicals, process and process histories, and facility modifications reside with personnel who have retired or who are contemplating retirement. Current budget projections reflect decreasing safety and industrial hygiene resource allocations after fiscal year 95, the timeframe in which D&D activities on site will be increasing. Lack of sufficient resources and a DOE-imposed accelerated schedule for implementing the Surplus Facilities Transition Program may not permit proper planning and characterization of chemical hazards before D&D activities begin. These condition and circumstances represent a low-priority vulnerability with a potential for short-term consequences.

ATTACHMENT 1

TEAM COMPOSITION

Area of Responsibility	Name/Organization
Team Leader	Bradley A. Peterson Office of Performance Assessment U.S. Department of Energy
Management/Operations	Bernard R. Kokenge BRK Associates, Inc.
Management/Training	Robert W. Everson Office of Safety and Quality Assurance U.S. Department of Energy
Chemical Process Safety	Ernest W. Johnson Oak Ridge Associated Universities
Industrial Hygiene	Carol L. Vega MSE, Inc.
Environmental Protection	Raymond F. Machacek Arthur D. Little, Inc.
Maintenance	F. Richard Myal Compa Industries, Inc.
Emergency Management	Robert D. Mogle Battelle, Pacific Northwest Laboratory
Site Liaison	Donna A. Jackson Savannah River Operations Office U.S. Department of Energy
Coordinator	Stephanie G. West Femald Environmental Management Company of Ohio
Technical Editor	Larry D. Warren Evergreen Innovations, Inc.

Attachment 2

CHEMICAL SAFETY VULNERABILITY REVIEW
VULNERABILITY FORM

DATE: April 25, 1994

Site/Facility:	Savannah River Site
Vulnerability Number:	CSVR-SRS-OOO-O1
Functional Area(s):	Operational Control and Management Systems, Emergency Management Program

1. Brief Description of Vulnerability.

Some facilities and work packages are not receiving adequate hazards analysis.

2. Summary of Vulnerability.

In some cases, the chemical safety and hazard analyses for work planning and emergency response planning are not complete or adequate. This problem is enhanced for decontamination and decommissioning (D&D)-type activities due to inexperience in conducting cleanup processes, lack of overall understanding of the associated problems, and lack of defined operating parameters. in addition, chemical safety has not been given sufficient priority in the past.

3. Basis.

a. Requirements:
- DOE 5480.23
- DOE 5481.1 B
- DOE 5500.3A

b. Chemicals Involved:
- Various solid sulfur-containing compounds
- Benzene from tetraphenylborate solution
- Sulfuric acid under pressure
- Other hazardous chemicals and wastes throughout the site

c. Relevant Self-Evaluation Data:
- Definitions of environment, safety and health concerns
- Programmatic action level
- Vulnerability data inclusion
- Prioritization recommendations

d. Contributing Causes:
- Potential hazardous chemical residues not identified
- Governing procedures for some activities (i.e., D&D) have not been extensively used and may be inadequate for some evolutions
- Insufficient definition of safe operating envelope for some activities
- Lack of experience related to work proposed in some work packages
- Heavy workloads for industrial hygiene personnel and their lack of involvement at pre-bid for subcontracts

Site/Facility:	**Savannah River Site**
Vulnerability Number:	**CSVR-SRS-OOO-O1**
Functional Area(s):	**Operational Control and Management Systems, Emergency Management Program**

3. Basis. (Continued)

e. Potential Consequences:

- The lack of or inadequate hazards analysis can result in improper procedures and controls being applied to work involving chemical safety hazards. Accidents or releases involving hazardous chemicals are more likely to occur in this type of environment.
- Inadequate or inappropriate technical analyses of the consequences of chemical residues, which may be present on or in equipment or systems, can result in personnel exposures to those residues or environmental releases of their reaction products, especially when operations are changed or during D&D-type work.
- Without chemical safety analysis and hazards analysis information, the adequacy of emergency planning zones cannot be determined, emergency classifications recognition criteria and emergency action levels cannot be fully and accurately developed, and protective actions for workers and the public cannot be adequately determined. Without this information, the emergency plan and implementing procedures are inadequate or incomplete.
- These conditions and circumstances represent a medium-priority vulnerability with the potential for short-term consequences.

4. Supporting Observations.

- Industrial hygiene review of work packages for hazard analysis is not always thorough and complete and may result in workers not being knowledgeable of the hazards associated with the job being performed. This is caused, in part, by (1) pressure from work-package originators for quick turnaround of the work packages in the work review cycle and (2) not being requested to be involved at the pre-bid phase for subcontracts. Note the following examples:
  - Lead Job at 784-A(U). Initially, the contract specified a torch-cutting operation. Instead, the work involved torch cutting of carbon steel painted with a lead-based paint, This change in process required the subcontractor to provide medical surveillance and lead training for personnel before the work was started. Consequently, the project was delayed. Had this work been allowed to start, overexposure to lead was possible.

    773A and 735A Carpet Removal. Initially, the industrial hygiene representative was informed that the project was only to remove a carpet. During removal of that carpet, asbestos-containing tile was found under the carpet. This process required several personnel to work numerous overtime hours.

- DOE 5480.23 requires chemical safety analysis and hazards analysis information to be developed or updated for nuclear facilities.

  Site personnel from the Federal Regulatory Compliance Group stated that some safety-related documentation at the Savannah River Site (SRS) has not been updated for almost 10 years. Old safety analysis reports (SARS) may not contain up-to-date chemical safety and hazards analysis information.

Site/Facility:	Savannah River Site
Vulnerability Number:	CSVR-SRS-OOO-O1
Functional Area(s):	Operational Control and Management Systems, Emergency Management Program

4. Supporting Observations. (Continued)

– A schedule for SAR update shows that update of some SARS may not be completed for several years.
- Although the SARS for nuclear facilities are being updated (long term), the basis for interim operations (BIOS) should capture the chemical analysis information sooner.

• DOE 5481.1 B requires chemical safety analysis to be developed for nonnuclear facilities. Nonnuclear facility SARS have not been developed at SRS. Chemical safety analysis and hazards analysis are not complete for the nonnuclear facilities.

- SRS is taking positive actions to determine which nonnuclear facilities will be required to have an SAR.
– Implementation guidance has not been provided by DOE Headquarters.

• A thorough hazards analysis review for chemical safety concerns related to D&D-type activities is especially important due to the lack of experience in this area. Although most operating facilities have fairly well defined safe operating envelopes, the same cannot be said for D&D-type activities. Many procedures to be used during D&D are relatively new to site personnel. Chemical residuals may also introduce unknown variables that must be addressed. The problems that can occur if hazards analysis is not adequately performed are demonstrated in the incident that happened at the 412-D Heavy Water Extraction Facility, On November 11, 1993, a worker appeared to have inhaled toxic gases after a pipe that contained chemical residues was cut. Lack of an appropriate technical assessment and of an appropriate chemical characterization was a contributing cause in the incident.

• Neither of the site welding manuals, SRSESM 050507-1 O-R or CMP 11-10.01, identifies the need for technical assessment of any potential internal chemical contaminants that could be encountered during a cutting or welding of pipes or vessels. This requirement has not been incorporated into these manuals even though the incident at the 412-D Heavy Water Extraction Facility occurred 6 months ago, which indicates that chemical safety is not adequately covered in some procedures.

b In addition to their other duties, some members of the industrial hygiene staff review as many as 50 work packages per week. Pressure is exerted on the department by work-package originators to provide quick turnaround of work packages. As D&D-type activity increases, this problem will increase. In addition, industrial hygiene staff are not always requested to be involved during pre-bid activities for subcontracts. As a result, industrial hygiene review of internal work packages may not always provide for a complete and through job hazards analysis before work is started.

Site/Facility:	Savannah River Site
Vulnerability Number:	CSVR-SRS-OOO-O1
Functional Area(s):	Operational Control and Management Systems, Emergency Management Program

4. Supporting Observations. (Continued)

- Westinghouse Savannah River Company (WSRC) technical personnel believe that the use of premixed sodium tetraphenylborate solution at the in-tank precipitation facility, being delivered on an as-used basis, will preclude the possibility of excessive in-tank degradation of the active reagent and minimize the inventory (and hence chemical vulnerability) of this process chemical. The decision to proceed in this manner has not been finalized even though the facility is being prepared for startup. The 188,000-gallon tank was designed and constructed based on limited options related to existing vendor capability. The requirement for this large tank has now disappeared, and recent vendor problems with sodium tetraphenylborate storage and processing indicates that smaller onsite quantities of this solution are advisable.

- A restricted workday case was recorded when an employee received second-degree burns after being sprayed with 94 percent sulfuric acid from a broken (1-inch diameter) acid line. This line was not insulated, was unsurveyed for wall-thickness and deterioration, and was located such that the failure resulted in a 20- to 30-foot spray distance (which reached an employee walkway).

- It was reported by WSRC emergency management personnel that there was a lack of concise facility-specific chemical safety analysis and chemical hazards analysis for facilities at SRS, and this adversely affects the emergency preparedness program. Information from chemical safety analysis and hazard analysis is a basis for developing emergency preparedness plans and implementing procedures. These personnel also stated that hazardous chemical information has not been kept current in safety-related documents.

CHEMICAL SAFETY VULNERABILITY REVIEW
VULNERABILITY FORM DATE: April 25.1994

Site/Facility: Savannah River Site

Vulnerability Number: CSVR-SRS-OOO-02

Functional Area(s): Operational Control and Management Systems, Facility Physical Condition

1. Brief Description of Vulnerability.

Knowledge about and characterization of chemical residuals at some facilities are not adequate.

2. Summary of Vulnerability.

Knowledge about and characterization of chemical residuals at some facilities being transitioned to or undergoing decontamination and decommissioning (D&D)-type activities are inadequate, Poor configuration management in the past and loss of experienced personnel have contributed to this lack of knowledge regarding chemical residuals. A formal program to characterize residuals at surplus facilities being prepared for transition is under development but is not in place. In addition, hazards analysis related to D&D-type activities are inadequate in some cases.

3. Basis.

a. Requirements:
- 29 CFR 1910.120, "Hazardous Waste Operations and Emergency Response"
- WSRC-8Q, *Emp/oyee Safety* Manua/, Procedure 36, Process System Access"

b. Chemicals Involved:
- Elemental sulfur
- Carbon
- Ferrous sulfate
- Carbonyl sulfide
- Carbon disulfide
- Sulfur dioxide

c. Relevant Self-Evaluation Data:
- Identified problem in Final Report Type B Investigation of November 11, 1993. Construction Worker Inhalation of Toxic Gas, dated January 1994
- Memorandum, "Chemical Safety Vulnerability Question Sets for Selected Savannah River Site (SRS) Facilities," dated April 1, 1994

d. Contributing Causes:
- Lack of resources (staffing; environment, safety, and health budgets)
- Accelerated schedule for transitioning facilities to the Office of Facility Transition and Management (EM-6o)
- Lack of knowledge regarding past activities that resulted in the residuals

Site/Facility:	**Savannah River Site**
Vulnerability Number:	**CSVR-SRS-OOO-02**
Functional Area(s):	**Operational Control and Management Systems, Facility Physical Condition**

3. Basis. (Continued)

e. Potential Consequences: Knowledge about chemicals or chemical residuals associated with a facility are of primary concern when converting that facility to a new mission or performing D&D-type activities. In these cases, unforeseen conditions are much more likely to occur from unknown or misunderstood mechanism related to those hazardous chemicals. This may lead to chemical releases and worker exposure to hazardous chemicals. These conditions and circumstances represent a low- to medium-priority vulnerability with the potential for short-term consequences.

4. Supporting Observations.

- **The Westinghouse Savannah River Company (WSRC) has established a policy that defines the actions necessary to transition surplus facilities. The policy has not been implemented and detailed requirements are not in place for transfer of shutdown facilities to EM-60. Recent direction from Headquarters, DOE, accelerated the schedule for this program to within the next 6 months versus 18 months as originally scheduled. Resource constraints and an accelerated implementation schedule may not permit proper planning and characterization of chemical hazards before facilities are transitioned to EM-60.**

- **On November 11, 1993, a worker at the 412-D Heavy Water Extraction Facility appears to have inhaled toxic gases after a pipe that contained uncharacterized chemical residues was cut. Lack of an appropriate technical assessment was a contributing factor in the incident. On November 12, 1993, the Manager of the Savannah River Operations Office directed a Type B Investigation be conducted in accordance with DOE 5484.1. The Investigation Board recognized that the Savannah River Site (SRS) had insufficient controls in place to prevent the toxic gas inhalation.**

- **Welding and cutting procedures were not in place to guide activities in which potentially hazardous materials existed. The final report was issued January 25, 1994; however, recognition of the need for technical assessment of internal contaminants that could be encountered during welding or cutting of a pipe or vessel has not been incorporated in either of the site welding and cutting manuals, SRSESM O4O7-1OR or CMP 11-10-1.**

- **The Board also recognized the lack of experienced technical personnel to support the work planning process. Many workers have taken early retirement (about 2,500), resulting in loss of historical familiarity with facilities. Facility shutdown and preparation of facilities for transition to EM-60 have forced many workers to find new jobs on site, sometimes using new skills in new surroundings.**

CHEMICAL SAFETY VULNERABILITY REVIEW
VULNERABILITY FORM (Page 3) **DATE:** April 25, 1994

Site/Facility:	Savannah River Site
Vulnerability Number:	CSVR-SRS-OOO-02
Functional Area(s):	Operational Control and Management Systems, Facility Physical Condition

4. Supporting Observations. (Continued)

- During a walkthrough of the 412-D Heavy Water Extraction Facility by team members, chemical residue was observed in a section of pipe that had been cut by a welding torch. The residue appears to be very similar to the residue involved in the incident on November 11, 1993. Pipes continue to be removed using the original welding and cutting procedures. On April 25, 1994, a work package, dated March 1994, was reviewed by team members to determine what employee protective measures were taken. The package requires fans when prevailing wind conditions are not adequate to remove toxic fumes. At times, asbestos and acid gas respiratory protection is required. (The employee at the site was wearing respiratory protection.) The supervisor verified this procedure was required to ensure protection. Employees are trained concerning hazards to be expected during the job. Water is sprayed on the cut after completion to reduce the temperature and thus stop any exothermic reaction.

- In the self-evaluation submission, WSRC identified an additional oily substance in the base of the hot and cold towers with a pH of about 1. While sampling and analysis has been initiated, it has not been vigorously pursued. On reviewing sampling data at the 412-D Heavy Water Extraction Facility, an analytical report for another oily substance showed a pH of about 3.3. A toxicity characteristic leachate procedure was not completed for this substance nor was an attempt made to identify other residue that could be present in the towers.

- During a walkthrough of the 164-P Power House, which is an abandoned facility, chemical residue was observed at a cleanout door of the smoke stack. The residue was yellow-gray in color and about 4 feet in diameter. The area in which the residue was located was open to the elements and drained to the coal-runoff basin. WSRC personnel questioned regarding the chemical composition of the residue did not know the characterization. Subsequent to the walkthrough, WSRC used x-ray diffraction techniques to analyze the deposit, and it found iron aluminum sulfate as the major constituent. Analysis for organic compounds has not been conducted. The analysis for organic compounds would be necessary before this facility is transitioned to EM-60. Having an uncharacterized chemical residue is a concern for planning any D&D-type activity.

CHEMICAL SAFETY VULNERABILITY REVIEW
VULNERABILITY FORM DATE: April 25, 1994

Site/Facility:	Savannah River Site
Vulnerability Number:	CSVR-SRS-OOO-03
Functional Area(s):	Identification of Chemical Hokdings, Operational Control and Management Systems, Human Resource Programs

1. Brief Description of Vulnerability.

In some areas, knowledge about chemicals and chemical inventory and the hazard communication programs are not adequate.

2. Summary of Vulnerability.

In some cases, important information relevant to chemical safety is not being communicated to workers and management. Situations exist where extremely hazardous chemicals are not tracked, hazards are not adequately communicated, and understanding of chemical safety is incomplete. Expertise is not always shared by divisions and facilities to provide the most up-todate working knowledge of hazards associated with operations activities.

3. Basis.

a. Requirements:
- 29 CFR 1910.1200
- 29 CFR 1910.106
- 40 CFR 262
- DOE 5460.10
- DOE 5700.6C

b. Chemicals Involved: Various hazardous chemicals throughout the site.

c. Relevant Self-Evaluation Data:
- Final Report Type B Investigation of November 11, 1993, "Construction Worker Inhalation of Toxic Gas"
- DOE F 5464.X, "Individual Acckfent/incident Report"

d. Contributing Causes: Inconsistency in implementation of chemical health and safety programs throughout the site.

e. Potential Consequences: Lack of knowledge about or understanding of chemical safety hazards can result in development of hazardous conditions or situations in which workers make mistakes. Accidents or releases involving hazardous chemicals are more likely to occur in this type of environment. These conditions and circumstances represent a low- to medium-priority vulnerability with a potential for short-term consequences.

Site/Facility:	Savannah River Site
Vulnerability Number	CSVR-SRS-OOO-03
Functional Area(s):	Identifiition of Chemical Holdings, Operational Control and Management systems Human Resource Programs

4. Supporting Observations.

- There is no system in place at the Westinghouse Savannah River Company (WSRC) for managing all aspects of chemicals from procurement to ultimate use and final disposition as either waste or excess. Furthermore, there is no system for tracking extremely hazardous chemicals once they arrive on site. Although WSRC has recognized this issue and is establishing a Chemical Comrnodities Management Group, this organization is not expected to be fully functional until the end of 1994. Lack of a system to track extremely hazardous chemicals represents a vulnerability over the short term and until the new group is functional.

- The current WSRC lessons-learned program provides thorough information for WSRC rnanagement and operating personnel from both internal and external sources. The prograrn does not specifically separate and highlight chemical safety topics for use by WSRC organizations. This hinders communication of important chemical safety information to workers. WSRC plans to rnodify the lessons-learned program within the next 6 months to identify chemical safety as a specific topic.

- The comprehensive Hazard Communication Program includes hazard evaluation, material safety data sheets (MSDSS), hazard warning labels, and information and training has been prepared and implernented at the Savannah River Site (SRS). Most elements of the program are in place. However, flaws were observed in this program.

  - Inadequate labeling of containers was observed in the 320-M Analytical Laboratory, Reagent Preparation Laboratory. Several chemicals did not have the National Fire Protection Association (NFPA) labels that are required by the Savannah River Site Hazard communication Prograrn, and one bottle containing nitric acid was labeled with the chemical formula only. The NFPA labeling system does not consider the target organ in its warning of hazards associated with a chernical.

  - MSDSS are the major tools for identifying hazards associated with chernicals and the actions necessary to mitigate exposures. Many defines were not readily accessible at SRS. At the 734-A Cylinder Shed, MSDSS were stored in a trailer located more than one block from the storage area; in the Environmental laboratory, Room 129, MSDSS were kept in an administrative office isolated from normal laboratory activities; for the L Reactor Chemical Storage Building, Building 11 O-L, MSDSS were kept in the maintenance shop.

Site/Facility:	**Savannah River Site**
Vulnerability Number	CSVR-SRS-OOO-03
Functional Area(s):	**Identification of Chemical Holdings, Operational Control and Management systems, Human Resource Programs**

4. Supporting Observations. (Continued)

When incompatible chemicals are stored together, spontaneous combustion is a concern. Incompatible chemicals were stored together in at least three areas visited. At L Reactor, oxygen cylinders were stored next to unsupported flammable gas cylinders; cylinders containing 10 percent methane and 90 percent argon were stored in an area labeled for storage of oxygen cylinders; cylinders containing 10 percent methane and 90 percent argon were stored in an area labeled for storage of empty oxygen cylinders. In the Research Laboratory supply room, 773-A Chemical Stores, gallon containers of nitric acid and hydrogenchloride acid were stored in the corrosive storage cabinet. A representative from the Industrial Hygiene Department took the compatibility chart and will use it as a training tool for chemical coordinators.

- **Neither of the site welding manuals, SRSESM 05057-1 O-R and CMP 11-10.1, identifies the need for technical assessment of any potential internal contaminants that could be encountered during welder cutting or welding of pipes or vessels. This requirement has not been incorporated into those manuals even though an incident occurred 6 months ago at the Heavy Water Extraction Facility.**

- **Industrial hygiene review of work packages for hazard analysis is not always thorough and complete and may result in workers not being knowledgeable about the hazards associated with the job being performed. This is caused, in part, by (1) pressure from work-package originators for quick turnaround of the work packages in the work review cycle and (2) not being requested to be involved at the pre-bid phase for subcontractor. Note the following examples:**

  – **Lead Job at 764-A(U). Initially, the contract specified a torch cutting operation. Instead, the work involved torch cutting of carbon steel coated with a lead-based paint. This change in process required the subcontractor to provide medical surveillance and lead training for personnel before the work was started. Consequently, the project was delayed. Had this work been allowed to start, overexposure to lead was possible.**

  – **773-A and 775-A Carpet Removal. Initially, the industrial hygiene representative was informed that the project was only to remove a carpet. During removal of that carpet, asbestos containing tile was found. This process required several personnel working many overtime hours.**

CHEMICAL SAFETY VULNERABILITY REVIEW
VULNERABILITY FORM **DATE: April 25, 1994**

Site/Facility:	Savannah River Site
Vulnerability Number:	CSVR-SRS-000-04
Functional Area(s):	Operational Control and Management Systems, Human Resource Programs

1. Brief Description of Vulnerability.

The Westinghouse Savannah River Company (WSRC) lacks a fully developed and implemented chemical safety program.

2. Summary of Vulnerability.

WSRC management systems for chemical safety are not fully implemented, and no overall program is in place for the entire site. [n part, this situation arises from chemical safety requirements being spread throughout multiple Department of Energy (DOE) Orders. Chemical safety initiatives have been started by several different WSRC organizations and a Chemical Commodities Management Center concept is in the early stages of development. Until these management systems are developed and implemented uniformly across the site, the effective management and control of hazardous chemicals at the Savannah River Site (SRS) is diminished.

3. Basis.

a. Requirements:
- 29 CFR 1910.1450
- 29 CFR 1910.119
- 29 CFR 1910.120
- 29 CFR 1910.1200
- DOE 5000.3B
- DOE 5480.18A
- DOE 5480.19
- DOE 5480.20

b. Chemicals Involved: Various hazardous chemicals and wastes throughout the site.

c. Relevant Self-Evaluation Data:
- Type B incident at the 412-D Heavy Water Extraction facility
- Need for characterization of residuals at several of the listed facilities
- Cited management documents

d. Contributing Causes:
- No centralized chemical safety program
- Lack of implementation of management systems
- Chemical safety requirements are spread throughout multiple DOE Orders

e. Potential Consequences:
- Lack of a fully developed and implemented chemical safety program and corresponding management systems at SRS could result in:
  - A situation where chemicals can be *lost” in the system,
  - Failure to dispose of chemicals promptly,

CHEMICAL SAFETY VULNERABILITY REVIEW
VULNERABILITY FORM (Page 2) DATE: April 25, 1994

Site/Facility:	Savannah River Site
Vulnerability Number	CSVR-SRS-OOO-04
Functional Area(s):	Operational Control and Management Systems, Human Resource Programs

3. Basis. (Continued)

- Improperly documented chemical residues in facilities and equipment,
- Failure to receive lessons-learned information on chemical safety issues, or
- Failure to receive adequate training in chemical safety and identification of chemical hazards.

- Accidents or releases involving hazardous chemicals are more likely to occur when these conditions exist. These conditions and circumstances represent a low-priority vulnerability with the potential for short-term consequences.

4. Supporting Observations.

- WSRC has not implemented a consistent sitewide program to manage hazardous chemicals from procurement to ultimate use and/or disposition. Several organizations at SRS have established individual systems for handling chemicals, particularly those chemicals no longer needed. However, this process is being carried out on a fragmented basis. Other aspects of managing chemicals on site, such as evaluating nonhazardous substitutes, minimizing chemical inventories, tracking extremely hazardous chemicals, and ultimately disposing of chemicals no longer needed, are either not in place or are being accomplished in a fragmented manner. In addition, discussions with Savannah River Operations Office (SR) personnel, who are completing a management assessment related to chemicals, confirmed the need for WSRC to implement a sitewide system for managing chemicals that are no longer in use.

- WSRC management has recognized the need for developing programs to deal with most of the above issues. In response, WSRC is developing a Chemical Commodity Management Center that will provide centralized management of chemicals across SRS, but that center is not scheduled to be fully operational until the end of 1994.

- DOE has not promulgated the requirements for chemical safety in a single DOE Order. Instead, the requirements are spread throughout multiple Orders which has the effect, in part, of making different parts of the contractor organization responsible for their implementation. This Order, in turn, makes chemical safety program implementation more susceptible to fragmentation, particularly at large sites such as SRS.

- In the P Reactor Area, personnel have been assigned to identify excess chemicals in various locations throughout the area. Chemicals found are placed in the Reactor Division Chemical salvage Program. Some of the chemicals found were not clearly identified or labeled. This circumstance indicates a lack of chemical inventory control and has a negative effect on emergency planning for chemical releases from the area.

- WSRC plans to implement a Surplus Facilities Transition Program to formalize requirements for transitioning surplus facilities. When implemented, this program will require characterization of each facility with respect to chemical residues. This program is not currently in place.

CHEMICAL SAFETY VULNERABILITY REVIEW
VULNERABILITY FORM (Page 3) **DATE: April 24, 1994**

Site/Facility:	**Savannah River Site**
Vulnerability Number:	**CSVR-SRS-OOO-04**
Functional Area(s):	**Operational Control and Management Systems, Human Resource Programs**

4. Supporting Observations. (Continued)

- **A recent SR surveillance report (94-SD-ISB-0143) on the WSRC Process Safety Management (PSM) Program required by 29 CFR 191O.119 concluded that "WSRC has not provided sitewide direction or established a sitewide approach to PSM compliance and issues." The report noted that each WSRC line organization approached and interpreted the standard applicability requirements of PSM without clear sitewide involvement.**

- **WSRC does not plan to formally implement a PSM Program until fiscal year 95 because there are no hazardous chemicals on site in quantities that meet or exceed threshold quantity levels (TQLs). Nevertheless, this program will be required for compliance with the currently proposed Environmental Protection Agency rule for hazardous chemicals or when quantities of chemicals meet or exceed the TQLs.**

- **The present WSRC lessons-learned program provides thorough information for WSRC management and operating personnel from both internal and external sources. However, the program does not specifically separate and highlight chemical safety issues and information for use by the WSRC organizations.**

- **Completion of training is not consistently verified before personnel access is granted to work areas where hazardous chemicals are located. An exception to this is at the Tritium and HB-Line areas, where access is limited through issuance of proximity badges only to those personnel who have completed facility-specific orientation training. No other area of SRS has this requirement. Under these conditions, the potential exists that personnel could be exposed to hazards due to lack of training and would not know what to do in the event of an emergency.**

- **Training requirements for many contractor and subcontractor positions at SRS are not consistently defined or controlled. Training and qualication programs for operators and supervisors are being upgraded substantially in some facilities, such as the H and F Tank Farms and the Effluent Treatment Facility. In these facilities, a qualification and requalification program is being established, although it is not scheduled to be fully implemented before 1996. Formal training improvement plans do not exist for most remaining facilities at the site, and a goal for sitewide consistency has not been established.**

CHEMICAL SAFETY VULNERABILITY REVIEW
VULNERABILITY FORM

DATE: April 25, 1994

Site/Facility:	Savannah River Site
Vulnerability Number:	CSVR-SRS-OOO-05
Functional Area(s):	Facility Physical Condition, Operational Controls and Management Systems, Human Resource Programs

1. Brief Description of Vulnerability.

Shifting departmental priorities are having an adverse affect on the site's overall chemical safety program.

2. Summary of Vulnerability.

Change of departmental missions is resulting in situations where workers are being shifted from production work in facilities they are familiar with to cleanup work in less familiar surroundings. Shrinking budgets are resulting in limited resources to address chemical safety. Continued loss of experienced personnel through early retirement, and possible reductions in environment, safety, and health (ES&H); quality assurance; and facility maintenance resources may occur in future years at the same time that D&D-type activities are increasing.

3. Basis.

a. Requirements:
- DOE 5480.10
- DOE 4330.4A

b. Chemicals Involved: Various hazardous chemicals and waste throughout the site.

c. Relevant Self-Evaluation Data: Not applicable.

d. contributing Causes

- Change of mission from production to decontamination and decommissioning (D&D)
- Workers being retrained to perform different types of work at different facilities
- Decrease in available staffing and budget for ES&H and maintenance activities
- Early retirement of highly experienced, long-tenured, personnel
- Time the facility has been idle before commencing D&D-type activities.

e. Potential Consequences:

- The factors listed above are combining to produce a workplace with:
  - Less experienced workers
  - A lower level of industrial hygiene support
  - A lesser ability to correct material problems
  - Loss of knowledge of chemical hazards associated with older facilities
  - More accidents or releases involving hazardous chemicals

  These conditions and circumstances represent a low-priority vulnerability with a potential for short-term consequences.

CHEMICAL SAFETY VULNERABILITY REVIEW
VULNERABILITY FORM (Page 2) **DATE: April 25.1994**

Site/Facility:	**Savannah River Site**
Vulnerability Number:	**CSVR-SRS-OOO-05**
Functional Area(s):	**Facility Physical Condition, Operational Controls and Management Systems, Human Resource Programs**

4. Supporting Observations.

- **Many facilities are being shut down and prepared for transition to D&D. This situation has forced many workers to find new jobs on site, sometimes using new skills in new surroundings. In addition, many workers (about 2,500) have taken early retirement, which has resulted in a significant loss of experience. Although training programs are in place, the loss of experienced personnel with extensive experience working with hazardous chemicals could have adverse effects on the overall chemical safety program.**

- **WSRC does not have a formal program to address the loss of experienced personnel due to retirement and declining budgets. However, WSRC (1) regularly recalls retirees to review various areas when questions arise, (2) supports annual gathers of SRS retirees, and (3) makes use of logbooks and operating records retained at the site. WSRC plans to continue this approach as SRS moves to increased D&D-type activity in the future. However, this creates the potential for loss of corporate memory. To offset this loss, WSRC management plans to pursue conduct of operations and training for future D&D-type projects. Nevertheless, erosion of the experience base is expected to continue as SRS moves to increased D&D-type activities.**

- **Poor configuration management practices in the past have resulted in less than adequate documentation of chemical residuals at some older facilities. In many cases, knowledge related to problems that may be encountered during cleanup resides only in the memories of experienced workers. As older workers are lost through early retirement (or are replaced by employees not historically familiar with the facility), old problems may surface. This situation is exacerbated by the length of time between facility shutdown and the time the facility is transitioned to the Office of Facility Transition and Management (EM-60).**

- **The availability of industrial hygiene staff to support activities at the Savannah River Site (SRS) is limited. Industrial hygiene support has been noted in past assessments as an area that needs improvement. However, because of continuing constraints on budgets, the situation remains about the same. Despite budget declines, the workload for industrial hygienists has not changed and extensive overtime is required (the average industrial hygienist works 17 hours of overtime per week). This situation may result in people being less effective, with the possibility of important items being overlooked. The Westinghouse Savannah River Company (WSRC) industrial hygiene management is evaluating ways to make more effective use of these personnel, such as allocating them to more critical, higher priority work, and eliminating or changing the way existing lower priority tasks are performed.**

- **As part of an internal budget exercise, WSRC is studying the impact of funding decrements of as much as 30 percent in areas of ES&H, quality assurance, and maintenance. Such reductions, if implemented, would continue to diminish the overall industrial hygiene program effectiveness (e.g., Hazardous Communication, Health Hazard Assessment, Hazard Prevention and Control, Purchase Approval Program, Chemical Monitoring, Heat Stress Management, Hearing Conservation).**

 DATE: April 25, 1994

Site/Facility:	Savannah River Site
Vulnerability Number:	CSVR-SRS-OOO-05
Functional Area(s):	Facility Physical Condition, Operational Controls and Management Systems, Human Resource Programs

4. Supporting Observations, (Continued)

- The current 5-year WSRC budget plan indicates an essentially constant full-time equivalent (FTE) level for industrial hygiene and safety staff for fiscal years (FYs) 94 and 95. However, the plan indicates a decline from 120 FTEs in FY 95 to 114 17Es in FY 96 and a further decline to 107 FTEs by FY 2000. This declining level of resources, crucial to supporting chemical safety, comes at a time when waste management and D&D-type activities are increasing at SRS. This apparent disparity, not having sufficient resources available to review the type of hazards associated with an increasing and diverse D&D work environment, represents a potential vulnerability.

- Insufficient resources and a DOE-imposed accelerated schedule for implementing the surplus facilities transition program could hamper proper planning and characterization of chemical hazards during the transition phase.

Attachment 3

SELECTED ACRONYMS

ES&H	Environment, Safety, and Health
D&D	Decontamination and Decommissioning
DOE	U.S. Department of Energy
SR	Savannah River Operations Office
SRS	Savannah River Site
WSRC	Westinghouse Savannah River Company

APPENDIX G

FIELD VERIFICATION REPORT

HANFORD SITE

MAY 2-11, 1994

CONTENTS

ATTACHMENTS

EXECUTIVE SUMMARY

This report presents the results of a review of chemical safety vulnerabilities associated with facilities owned or operated by the Department of Energy (DOE) at the Hanford Site. The field verification review took place from May 2 to May 11, 1994, and was part of the Chemical Safety Vulnerability Review being conducted by the Office of Environment, Safety and Health at the direction of the Secretary of Energy. The purpose of the review is to identify and characterize conditions or circumstances involving potentially hazardous chemicals at DOE sites and facilities. Specifically, the review is designed to identify, characterize, and prioritize chemical safety vulnerabilities associated with conditions or circumstances that might result in (1) fires or explosions from uncontrolled chemical reactions, (2) exposure of workers or the public to chemicals, or (3) releases of chemicals to the environment.

Activities involving the use of hazardous chemicals at Hanford include production-related processes and operations; cleanup of facilities being shut down; laboratory processes; long-term, large-scale storage; and the treatment and disposal of hazardous wastes. The lines of inquiry developed for the Chemical Safety Vulnerability Review were used as a guide for field verification activities at Hanford. All facilities included in the Hanford self-evaluations were reviewed, and additional facilities were reviewed when further information was needed. Tank farm operations and facilities were excluded from this review because of the numerous documented appraisals and ongoing reviews being conducted by DOE and other external groups.

The Hanford field verification was conducted with a view toward identifying possible DOE-wide chemical safety vulnerabilities. Three chemical safety vulnerabilities were identified at Hanford, none of which represent a potential consequence of high severity in the near term:

- Large quantities of surplus hazardous chemicals are being stored for prolonged periods in production facilities that are being transitioned to deactivated status;
- Weaknesses exist in some aspects of the hazard analysis program at Hanford; and
- A loss of corporate knowledge may adversely affect cleanup activities at the Hanford Site.

Two chemical safety vulnerabilities identified at Hanford are associated with (1) the prolonged storage of hazardous chemicals in shutdown or deactivated facilities and (2) the loss of corporate knowledge that will be critical when equipment and systems are operated, breached, or disassembled during cleanup activities. In both cases, the field verification team noted that the process of transitioning facilities from an operational status to deactivation, surveillance and, maintenance, and decontamination and decommissioning requires a significant period of time. This prolonged process is partly a result of the DOE decision-making process, the involvement of stakeholders, and multiple requirements by regulatory organizations. The other chemical safety vulnerability reflects weaknesses in job hazards analyses, chemical safety training, hazards analysis for nonnuclear, low-hazard facilities, and differing work control systems used by the multiple contractors at the Hanford Site.

These vulnerabilities, along with those identified at other DOE sites, will be evaluated to identify DOE-wide generic vulnerabilities. Information from the Office of Environmental Management's Surplus Facilities Inventory Assessment and the extended review of potential organic-nitrate vulnerabilities (similar to those at Tomsk-7) will also be considered. The results of these activities will be reviewed for additional insights into potential chemical safety vulnerabilities.

Vulnerabilities identified at Hanford will be used to develop a site-specific management response plan, which in turn will provide input for the DOE-wide management response plan.

The field verification team identified six commendable practices during its review of Hanford facilities:

- The Pacific Northwest Laboratory's (PNL) computer-based Chemical Management System (CMS), which inventories chemicals by using bar-codes to facilitate tracking and inventory checks;

- The Hanford Occupational Exposure Assessment Program (HOEAP), which was developed to provide a uniform sitewide occupational exposure assessment system by grouping similar activities and documenting qualitative assessments in a common data base;

- A cooperative program between DOE, PNL, and Westinghouse Hanford Company in the 300 Area, which resulted in a tenfold reduction in the discharge of wastewater since 1988 and has greatly improved wastewater quality;

- A unique Hazardous Materials Management and Emergency Response (HAMMER) program, which will provide hands-on, performance-based training in all aspects of hazardous materials safety;

- A PNL system to notify the PNL Emergency Coordinator when chemical inventories reach 90 percent of the facility permissible threshold quantity, so that potential impacts to emergency plans can be monitored; and

- A post-traumatic shock-treatment program at the Hanford Environmental Health Foundation, which cares for the emotional and psychological needs of accident victims, their co-workers, and family members,

1.0 INTRODUCTION

1.1 Purpose and Scope

Based on direction from the Secretary of Energy, the Assistant Secretary for Environment, Safety and Health established the Chemical Safety Vulnerability Working Group to review and identify chemical safety vulnerabilities at facilities owned or operated by the Department of Energy (DOE). The information obtained from the review will provide the Working Group with valuable input for identifying generic chemical safety vulnerabilities that confront the DOE complex. Identifying and prioritizing generic chemical safety vulnerabilities will provide an appropriate basis for the Department's focus on programs, funding, and policy decisions related to chemical safety. The Secretary directed the Office of Environment, Safety and Health (EH) to lead this effort, with the full participation of DOE line programs having operational responsibilities.

The Chemical Safety Vulnerability Review was designed and undertaken to identify and characterize adverse conditions and circumstances involving potentially hazardous chemicals at facilities owned or operated by the Department. Specifically, the review was designed to identify, characterize, and prioritize chemical safety vulnerabilities associated with conditions or circumstances that might result in (1) fires or explosions from uncontrolled chemical reactions, (2) exposure of workers or the public to hazardous chemicals, or (3) release of hazardous chemicals to the environment. Using input provided by line organizations with operational responsibilities, the Working Group developed a project plan[1] to guide the review.

The field self-evaluation phase of the Chemical Safety Vulnerability Review used a standardized question set developed and distributed by the Working Group to collect data related to chemical safety from 84 facilities located at 29 sites. Based on review of this input, nine sites, including the Hanford Site, were selected to participate in the field verification phase of the review. The field verification process was designed to use independent teams of technical professionals with experience in a variety of technical disciplines to confirm the accuracy and completeness of the data compiled during the field self-evaluation phase of the review. This report documents activities related to the field verification phase of the Chemical Safety Vulnerability Review.

The field verification team visiting Hanford examined a broad range of facilities (based on facility type and operational status), with special attention given to those facilities being transferred to, awaiting, or undergoing decontamination and decommissioning (D&D). Different types of chemical- and waste-handling facilities—including laboratories, process facilities, and waste treatment and storage facilities—were examined. (See Section 1,3 for a listing of the key facilities visited.)

The field verification team, under the direction of a DOE team leader, was composed of DOE and contractor personnel with technical expertise in various aspects of chemical safety, including management and operations, training, chemical process safety, industrial hygiene,

[1] "Project Plan for the Chemical Safety Vulnerability Review," dated March 14, 1994.

maintenance, environmental protection, and emergency preparedness. A team composition list is provided in Attachment 1 of this appendix.

The team began its review at Hanford by visiting each of the facilities selected for self-evaluation. The team met with management or technical representatives from each of the facilities reviewed. Individual and small group meetings were also held, and team members conducted facility walkthroughs, document reviews, and personnel interviews to gather information related to potential chemical safety vulnerabilities at Hanford. The team leader met periodically with local DOE and contractor management to discuss the team's activities and to review issues that may have surfaced during the previous day. Before the field verification team left the Hanford Site, DOE and contractor management conducted an onsite factual accuracy review of the draft document. An outbriefing was conducted on Wednesday, May 11, 1994, and a copy of the draft report was provided to the Richland Operations Office (RL).

1.2 Site Description

The Hanford Site comprises 560 square miles of semiarid desert in southeastern Washington State (see Figure 1). The Columbia River flows through the northern part of the site and turns south to form part of its eastern boundary. The Yakima River forms part of the site's southwestern boundary. The areas adjoining Hanford to the west, north, and east are predominantly agricultural, including vineyards, orchards, and rangelands. The Tri-Cities of Rich land, Kennewick, and Pasco, with a combined population of about 150,000, are located southeast of the site. Hanford is currently operated by four major contractors: Westinghouse Hanford Company (WHC); Battelle Memorial Institute's Pacific Northwest Laboratory (PNL); ICF Kaiser Hanford Company (ICF KH), a subcontractor to WHC; and Hanford Environmental Health Foundation (HEH F). Bechtel Hanford Incorporated will assume the remediation contract later this year.

The Hanford Site is divided into several areas, each of which is devoted to specific types of facilities and activities. Nine older plutonium production reactors are located in the 100 Areas, which are situated along the Columbia River in the northern part of the site. All nine reactors have been retired, and eight are in an advanced stage of decontamination and decommissioning. Chemical processing and waste management facilities (including the PUREX Plant, the Plutonium Finishing Plant, and the tank farms) are concentrated in the 200 Areas, East and West. The 300 Area, located in the southeast corner of the site, contains a complex of laboratories, technical shops, engineering offices, and support facilities that focus on research and development associated with waste management and energy technologies. The 400 Area is located north of the 300 Area and includes a retired sodium-cooled fast flux test reactor.

The Hanford Site includes facilities constructed during World War II as well as recently built modern structures. Defense production has been the primary mission throughout most of the site's history. Today, however, Hanford's activities focus on environmental restoration and waste management; scientific and environmental research; development and application of radioactive and hazardous waste management technologies; and the design, construction, and operation of major energy-related test and development facilities.

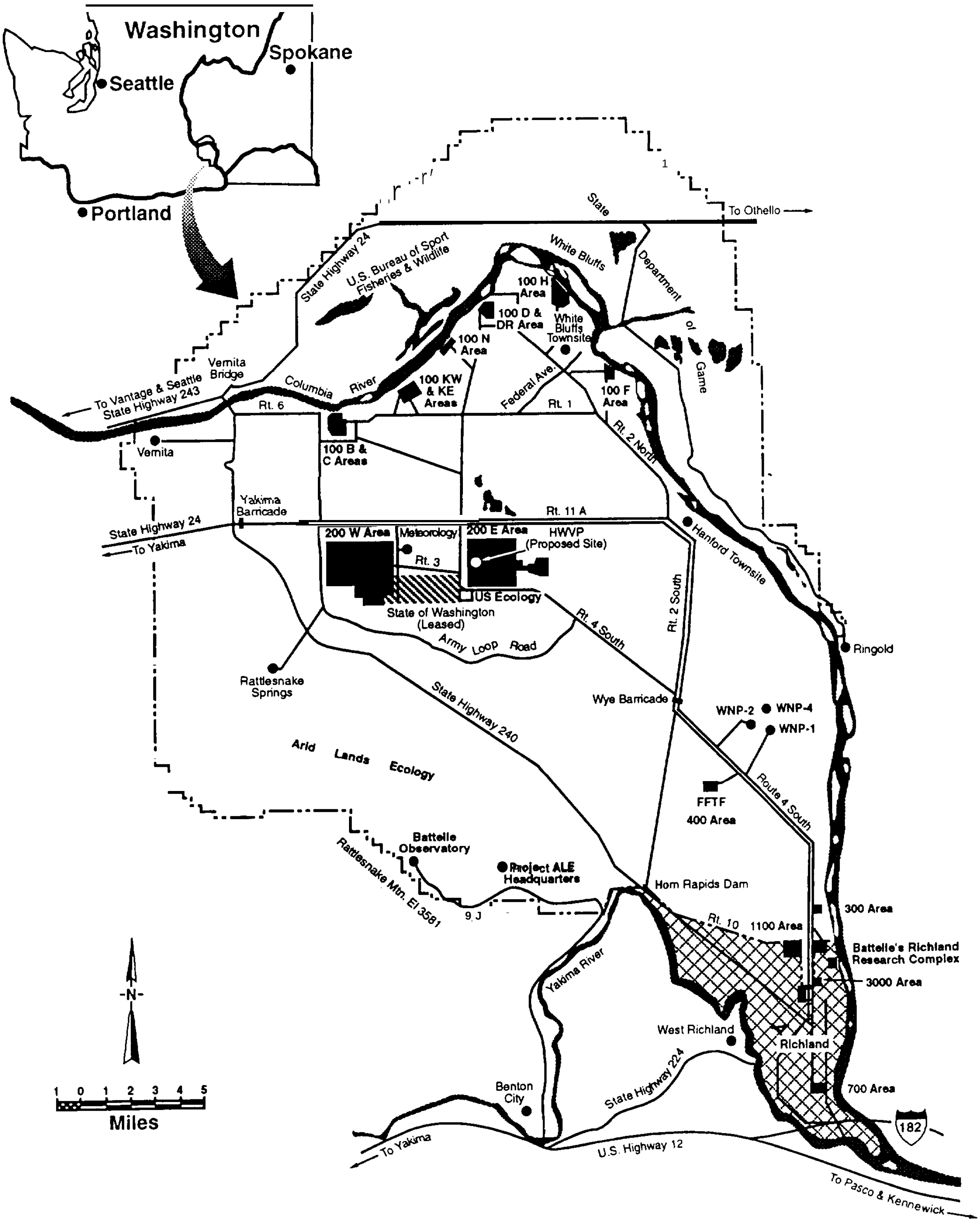


Figure 1. Hanford Site.

1.3 Facilities Visited

Tables 1 and 2 identify key facilities visited by members of the field verification team at the Hanford Site and include information related to the physical condition and mission of each facility.

Table 1. Key WHC Facilities Visited at Hanford.

FACILITY	MISSION	DESCRIPTION
Chemical Engineering Laboratory, 2703E Building*	Nonradioactive chemical engineering pilot plant, process demonstration and evaluation of chemical-proceesing equipment	Completed in 1963, the Chemical Engineering Laboratory is a steel-frame structure with dimensions of about 48 x 60 x 44 feet. The building includes two modular mezzanines. Adjacent to the building are (1) two pre-engineered storage buildings designed for hazardous chemical and waste storage and (2) several prefabricated storage units, one of which is currently used for storage of dry chemicals.
Water Treatment Plant, 283E Building	Potable water for 200 East Area	Constructed in the 1940s, the water treatment facility has been modified and upgraded several times. The facility has a capacity of 2,600 gallons per minute. The chlorination system building has one cylinder in service and room to store three additional cylinders The chlorination feed system was upgraded in 1993.
Plutonium Finishing Plant, 234-5Z Building*	Process facility, laboratory, and storage facility for special nuclear material	Built in 1849, the Plutonium Finishing Plant is a steel-frame structure overlaid by noncombustible materials. The plant's dimensions are about 180 x 500 feet, The vault and process area doors of the facility are constructed of steel and have combination safe-type locks. The larger process portions of the facility are currently inactive. Small glovebox portions of the facility, the laboratories, and the storage vaults are still operational.
PUREX Plant, 202A Building*	Process facility	Built in 1952, the PUREX Plant is a reinforced-concrete structure with dimensions of about 1,005 x 119 x 100 feet. The building has three main structural components: (1) a thick-walled concrete canyon in which equipment for radioactive processing is housed; (2) the Pipe and Operating, Sample, and Storage galleries; and (3) a steel and transite annex that houses offices, process control room, laboratories, and building services. Adjacent to the main building are a tank yard for chemical storage and a number of support buildings, one of which is used for chemical storage. The PUREX Plant is currently undergoing deactivation.
RCRA Hazardous Waste Storage Facility, 616 Building	Permitted for storage of nonradioactive hazardous waste	Completed in 1966, this two-story, reinforced-concreta building was designed specifically for storage of hazardous waste defined under the Resource Conservation and Recovery Act (RCRA), The facility contains an office area, a staging area for receiving and dispensing containers, a sampling/analysis area, and four container storage bays separated by concrete walls. One bay is used for flammable liquids with flashpoints of less than 70 OF and has blowout roof and wall panels.

Facilities marked with an asterisk (*) were included in the field self-evaluation process.

Table 2. Key PNL Facilities Visited at Hanford.

FACILITY	MISSION	DESCRIPTION
High Bay Engineering Laboratory, 324 Building*	pilot-scale and full-scale demonstration activities, development of waste solidification equipment	The High Bay Engineering Laboratory has dimensions of 43 x 48 x 65 feet and is part of a larger structure (324 Building) that has been designated as a Category 2 nuclear facility. The 324 Building contains several large hot cells for working with highly radioactive materials, but the High Bay itself is not used for work involving radioactive materials.
Warehouse, 37 l 8G Building*	Storage of nonradioactive chemicals for 324 Building	37 l 8G Building is a single-story, steel-frame building with about 3,5oO square feat of floor apace. The front of the building contains a staging area, cabinets and shelves for storing supplies, and small quantities of solid chemicals. The rear section is cubed and used for the bulk storage of liquids.
Life sciences Laboratory 1, 331 Building*	Research and development in biology and the environmental sciences	Completed in 1971, the Life Sciences Laboratory is a 127,000-square-foot, three-story building constructed of reinforced concrete. The ground floor and third floor contain administrative offices, maintenance ahops, a variety of laboratories, and animal and surgical facilities. The second floor houses the heating, ventilation, and air-conditioning system and service areas and has a mezzanine overlooking the main Iobbv and Iibrary.
RCRA Hazardous Waste Storage Facility, 305B Building	Permitted for storage and packaging of RCRA hazardous and mixed waste	The facility consists of a two-story, high-bay, concrete building constructed in the early 1950s. The basement contains two vaults that originally housed small test reactors. One vault has been converted for storing mixed waste. The ground floor contains administrative offices and a high bay that was originally used for pilot testing. The high-bay area was modified and upgraded several years ago for storage of nonradioactive hazardous wastes.

Facilities mailed with an asterisk (*) were included in the self-evaluation process.

2.0 SUMMARY OF RESULTS

The field verification process was designed to use independent teams of safety professionals to verify the accuracy and completeness of data provided to the Chemical Safety Vulnerability Review by Hanford facilities selected to participate in the field self-evaluation process. The verification process offers an opportunity to scrutinize site-specific chemical safety vulnerabilities and to make informed judgments about the possible relevance of these conditions to determinations of generic chemical safety vulnerabilities.

The goal of the field verification team was to identify chemical safety vulnerabilities at Hanford. Before arriving on site, team members reviewed the self-evaluation data and other documents to develop lists of potential vulnerabilities for their functional areas. During the onsite portion of the review, team members visited facilities selected for self-evaluation to verify reported observations and to look for other conditions or circumstances that might result in chemical safety vulnerabilities. Water treatment facilities using chlorine that were not included in the original self-evaluation were also reviewed. Team members who visited these facilities coordinated with their site counterparts to arrange for the appropriate walkthroughs or interviews.

To support effective team management and to expedite the identification of vulnerabilities across a wide range of technical disciplines associated with chemical safety, the field verification review was organized to include five functional areas:

- Identification of chemical holdings, including the properties of chemicals located at the facility, the characterization of those chemicals, and an analysis of the inventory.
- Facility physical condition, including engineered barriers, maintenance conditions, chemical systems, safety systems, storage, monitoring systems, and hazards identification.
- Operational control and management systems, including organizational structure; requirements identification; hazard analysis; procedural adherence; maintenance control; engineering and design reviews; configuration control; safe shutdown plans; and site programs for quality assurance, chemical safety, inventory control, access control, disposal, transportation and packaging, and corrective actions.
- Human resource programs, including technical competence, staffing, training and qualifications, employee involvement, employee concerns, personnel performance requirements, and visitor and subcontractor access control.
- Emergency management program, including the emergency response plan, in-plant consequences, environmental issues, coordination with the community, and community right-to-know issues.

These functional areas were evaluated based on lines of inquiry provided in Attachment 1 of the “Field Verification Guide for the Chemical Safety Vulnerability Review,” dated

April 8, 1994. A summary of results for each of the functional areas is provided below. Completed chemical safety vulnerability forms resulting from the field verification activities at Hanford are provided in Attachment 2 of this appendix.

2.1 Identification of Chemical Holdings

Verification activities associated with the chemical holdings functional area indicate that chemical inventories in facilities reviewed at Hanford are below 25 percent of the threshold quantities listed in 29 CFR 1910.119 or 40 CFR 68. The one exception is nitric acid, which was used as a process chemical in the Plutonium Finishing Plant (PFP) and the PUREX Plant. Nitric acid in storage at these plants totals approximately 1,000 tons. Other process chemicals stored at PFP and PUREX in ton quantities include aluminum nitrate solutions, sodium hydroxide, sodium nitrate, sodium nitrite, carbon tetrachloride, and tributylphosphate dissolved in normal paraffin hydrocarbon (NPH). These chemicals are stored outside in stainless-steel tanks, and there is some concern about the potential corrosion of older tanks. The long-term, outdoor storage of carbon tetrachloride in drums at PFP is unsatisfactory.

These conditions are described in Vulnerability CSVR-RL-HAN-O1, which concludes that the prolonged storage of hazardous chemicals in shutdown or deactivated facilities may lead to unanticipated hazards caused by leakage, spills, evaporation, decomposition of chemicals, or lack of adequate administrative controls. Since 1991, however, there has been significant progress in reducing bulk storage of hazardous chemicals. More than 2,000,000 pounds of hazardous chemicals have been removed from the site, including nitric acid, sulfuric acid, NPH, potassium hydroxide, and hydrogen peroxide from PUREX, as well as hydroxylamine nitrate and calcium metal from PFP.

While the field verification visit was in progress, EH requested that the verification team include chlorination facilities in the review scope. The site provided a list of eight water supply facilities with chlorine inventories exceeding the threshold quantities stipulated in 29 CFR 191O.119. (Treated sanitary waste is discharged to septic drain fields or to evaporation beds without chlorination.) Facilities 163-N, 183-KE, 182-B, 182-D, 283-W, 283-E, and 315 were each reported to have inventories of chlorine ranging between 2,000 and 4,000 pounds. Facility 183-D includes storage of chlorine cylinders with a total reported inventory of 24,000 pounds. Chlorine at these facilities is supplied from 1-ton cylinders and is added to water by means of the same process used in many municipal water supply and wastewater treatment plants. The remote placement of many Hanford units minimizes risk to the public. Releases from some of these facilities, however, could threaten occupants of site buildings. Facility 315 is located about ¾ mile from the nearest private residences, but it is within about 200 feet of PNL buildings housing several hundred people. (Facility 315 was the subject of an analysis in 1993, summarized in DOE/E H-0340, Example *of Process Hazard Analysis of a Department of Energy Water Chlorination Process,* dated September 1993.) The chlorination system at facility 283-E was examined by the team. This system was upgraded in 1993 and is the same as that used at facility 283-W. The designs for chlorine feed and cylinder storage and the procedures used for inspections, maintenance, and cylinder changeout were found to be satisfactory for minimizing hazards arising from chlorine leaks, but the need to provide locked access to chlorine facilities needs to be reviewed. Although no indicators were found of a risk higher than those at well-designed and well-maintained municipal facilities, alternatives to gaseous chlorination, such as sodium hypochlorite solution or ultraviolet treatment, should be considered for increasing worker and public safety.

The three laboratory facilities reviewed by the verification team contained a wide variety of chemicals, including nonhazardous chemicals such as glucose and glycerol, hazardous chemicals such as inorganic and organic acids, and hazardous and mixed wastes in temporary storage at satellite accumulation areas. The two engineering laboratories (Chemical Engineering Laboratory [CEL] and High Bay Engineering Laboratory [HBEL]) use relatively large quantities of hazardous chemicals (e.g., nitric acid, sodium nitrite, formic acid, and sodium hydroxide) to prepare simulated high-level wastes for testing treatment techniques. At HBEL, these chemicals are stored in an external warehouse, and about every 6 months, they are moved into the laboratory to support process operations that typically last for several weeks. At CEL, chemicals are withdrawn from storage as needed. The contents of chemical warehouses for both laboratories were less than the threshold quantities stipulated in 29 CFR 1910.119 and 40 CFR 68. Storage, labeling, and containment of chemicals were found to be satisfactory-although 3718G Building, the principal chemical warehouse for HBEL, does not have a fire suppression system (it does have smoke detectors, alarms, and pull stations). This condition is recognized by PNL, and plans are in place for a new warehouse estimated to be completed in FY 95.

Both WHC and PNL have developed and implemented computer-based chemical inventory systems. The WHC system, Hazardous Materials Inventory Database (H MID), was implemented primarily to comply with Title Ill of the Superfund Amendments and Reauthorization Act of 1986 (SARA) and other reporting requirements. Input is provided by all facilities maintain local data bases and upload data into HMID on a monthly basis; thus, the system is not "real time." The system contains valuable information that could be used by management for tracking and controlling hazardous materials on site, but that application has received limited use.

PNL uses a computer-based inventory system, the Chemical Management System (CMS), to inventory chemicals, provide data for SARA Title III reporting, provide hazard information, and minimize chemical waste. CMS includes a linkage to the purchasing system so that new chemicals are automatically recorded in the data base. New chemical containers are bar-coded on receipt, and all existing chemical containers in PNL facilities have bar-codes, thereby facilitating tracking and inventory checks. CMS has been in use since November 1991 and is fully implemented at PNL facilities. The field verification team at Hanford recommends CMS as a commendable practice.

Chemical residues are of concern primarily in PFP and PUREX, where small quantities of nitric acid have been left in glovebox lines and equipment or in canyon lines and vessels. Most of these solutions contain special nuclear material and radioactive residues that will be neutralized and flushed to waste tanks as part of the continuing cleanout and deactivation process.

Hazardous waste inventories for the facilities reviewed by the field verification team are managed in accordance with the programs established respectively by PNL and WHC to meet the requirements of regulations promulgated by the State of Washington under delegated authority from the U.S. Environmental Protection Agency. Each program establishes a basic infrastructure of plans, procedures, guidance, and oversight with concomitant organizations and responsibilities. The centralized, permitted Resource Conservation and Recovery Act (RCRA) Waste Storage Facilities located in 305B Building (for PNL) and 616 Building (for WHC) are managed by their respective central waste management groups. Both are well designed and operated, and both are exemplary in almost every respect. Although there are fundamental differences in the degree of centralized control with which satellite accumulation and 90-day storage areas are administered (e.g., location and usage), each program relegates management of these areas to the organization that generates the waste (i.e., the "generator"). Guidance is provided through training, procedures, technical support, and coordination of self-assessments.

Characterizations of accumulated hazardous wastes are largely the responsibility of the generator. Specific waste acceptance criteria have been developed, not only for waste characterization but also for packaging and labeling. Since there is generally a high degree of process knowledge related to waste generation, only a small percentage of hazardous waste containers is currently analyzed. Most wastes requiring analysis are mixed wastes. Negotiations between waste management groups and the State of Washington, however, will likely result in requirements for a random sampling and analysis program that may increase sampling and analysis to between 5 and 10 percent of the containers.

An area needing enhancement involves generator implementation of procedures and localized controls. Performance in this area is generally good, but inconsistencies were reported for labeling, co-storage of incompatibles, and maintenance of area logs. These are not considered to represent significant chemical safety vulnerabilities, but they indicate of a need to upgrade overall performance-not only to ensure compliance but to enhance attitudes in a manner consistent with responsible hazardous materials management.

Water discharges from all evaluated facilities are well controlled and reflect the sitewide program undertaken in 1989 to improve water and wastewater management. In most buildings, blind sumps are now used or sump drains are locked and are subject to administrative controls before use. In large part, these controls are based on the 1988 Federal Facilities Agreement and Consent Order (or Tri-Party Agreement), which required a comprehensive program to reduce uncontrolled releases. In the past, most water drains and sumps were discharged to "cribs" or process trenches, with few controls and no wastewater treatment. The verification team observed an increased sitewide awareness of the need to exercise conservation in water use in general, as well as to control wastewater discharges. The comprehensive water management program currently being undertaken includes installation of wastewater treatment systems both at specific facilities and for area-wide treatment, retirement of drains and sumps, implementation of engineered and administrative controls for operating sumps and drains, and upgrade of associated drainage and transfer piping. In the 300 Area alone, cooperation between RL, PNL, and WHC has reduced wastewater discharges from 1,500 gallons per minute (gpm) in 1988 to fewer than 150 gpm today and has greatly improved wastewater quality. In 1993, this program earned the energy efficiency award for water conservation at Federal facilities. These are commendable efforts and reflect a successful hierarchical approach to wastewater minimization that began with source reduction and progressed through waste segregation to waste treatment and disposition.

Exhaust stacks, vents, and fugitive emissions have been well characterized for most facilities reviewed at Hanford, and required controls have been implemented. The principal exception involves laboratories, which generally have been exempt from air emissions regulations. Laboratories alone are unlikely to represent a vulnerability with respect to air emissions; however, a concerted effort has not been made to characterize these sources accurately. Initiatives in this area are currently under way to respond to air toxics regulations and to permitting requirements resulting from amendments to Title V of the Clean Air Act.

2.2 **Facility Physical Condition**

Verification activities associated with the facility physical condition functional area included review of general maintenance conditions at all facilities selected to participate in the field self-evaluation. In addition, the verification team visited the 616 Building, the 305B Building (RCRA storage facilities), and the 283-E water supply facility (which is operated for WHC by ICF KH). The review focused on conduct of maintenance activities, maintenance program controls, work controls, and the structural and mechanical integrity for various systems (e.g., heating, ventilation, and air conditioning).

In general, the condition of these facilities was as described in the self-evaluations, which noted no special problems likely to result in chemical safety vulnerabilities. The self-evaluation for the PUREX Plant, however, indicated that portions of cell walls and floors have been eroded by nitric acid contamination and that some vessels show evidence of corrosion from chemical spills. These conditions could not be verified because access to the affected areas is limited. In addition, subsurface conditions around some sump and drain systems at many of the facilities visited have not been investigated, although these systems have carried waste chemicals in the past and could be deteriorating (e.g., at PFP). However, discharge “cribs” have been evaluated as a part of the Tri-Party Agreement, and contamination is being monitored and/or remediated. Because of their location and magnitude, sumps and drains are not generally considered to be a chemical safety vulnerability. Collectively, these issues could represent a potentially costly addition to future deactivation and D&D activities, and sumps and drains will need to be addressed as part of future transition plans.

Equipment used at PNL facilities in the 300 Area was observed to be in good condition. Heating and ventilation equipment at 331 Building was determined to be in particularly good condition, reflecting the existence of an effective preventive maintenance program. This equipment is important for maintaining adequate temperature control and balanced airflow for a variety of activities and experiments. Corrective maintenance program controls are adequate, and improvements were being developed at the time of this review. For example, a revised work package system will include a job planning checklist to ensure proper inclusion of hazard controls.

The High Bay Engineering Laboratory (HBEL) contains a large amount of test and experimental equipment related to the High-Level Waste Project. This equipment is maintained in a slightly different manner in that preventive maintenance is accomplished only when test and operations activities are scheduled. Other equipment in this facility is included in the existing PNL Preventive Maintenance Program. It was observed that a few eyewash and emergency shower facilities were not well maintained—that is, eyewash fountains were dirty and plastic protectors were not installed. Plans were being developed to increase the test/flush frequency of this equipment. The self-evaluation indicated that the exterior warehouse used for chemical storage was inadequate (e.g., fire suppression systems were not available). Verification team members visiting the warehouse were informed that a new storage facility is planned.

The PUREX Plant is being transitioned to D&D, and equipment is being deactivated as defined by the Deactivation Project Management Plan. Some equipment that will be operated at least one more time (e.g., for storage tank deactivation) has been placed in a deferred maintenance condition. Surveillance is conducted to identify potential maintenance problems, and maintenance is performed on an as-needed basis. (Examples include the storage tanks for nitric acid, sodium hydroxide, and other process chemicals located outside the main facility.) Inventories of these chemicals were specifically identified in the self-evaluation. Deterioration of this equipment could pose a problem for future operations if the deactivation process is delayed. Housekeeping in the 2714A chemical storage warehouse at PUREX was observed to be poor. Small amounts of chemicals were found stored along with old furniture. Storage areas for maintenance materials (e.g., paint, lubricating oil, and adhesives) were observed to be in excellent condition.

Maintenance at the Plutonium Finishing Plant is still being conducted in a routine manner. Several major repairs to ventilation supply and exhaust systems were in progress at the time of the review. Portions of the facility are being transitioned to a D&D status. Deactivation plans will be developed after completion of an Environmental Impact Statement (EIS). The condition of equipment was generally observed to be good, with no obvious deficiencies that are likely to result in chemical safety deficiencies.

Conditions at the Chemical Engineering Laboratory were observed to be satisfactory. The facility is basically sound, except for minor leaks in the roof. Experimental equipment is properly maintained.

The 616 Building, used for nonradioactive hazardous RCRA waste storage, and the 305B Building, used as a hazardous waste storage and repackaging facility, are both reinforced concrete structures. Both facilities are in excellent condition and are regularly inspected. The 616 Building is an excellent example of a well-designed and well-managed RCRA storage facility,

The 283-E water treatment area was observed to be well maintained. The chlorinator unit is well equipped and in excellent condition, A new chlorinator and leak detection instruments were installed less than a year ago, as is the case at a similar facility (283-W) in the 200 West Area. The chlorine feed system and storage area are adequately designed, including features to maintain a negative pressure in the delivery lines and ventilation systems for potentially occupied areas. Both audible and visual alarm systems, which are tested weekly, are provided at the facility. The WHC Fire Department is equipped with kits approved by the Chlorine Institute to clamp and seal leaking cylinders.

2.3 Operational Control and Management Systems

The operational control and management systems functional area was reviewed as part of the field verification visit to the Hanford Site. In addition to the lines of inquiry, this review focused on the process whereby facilities are transitioned from an operational status to D&D.

Each of the self-evaluation reports compiled by WHC and PNL contains a summary of the programs, procedures, and management systems currently in place to control chemical safety vulnerabilities. Chemical safety at WHC and PNL facilities is based on multiple programs already in place. Existing organizations provide the management structure for these multiple programs; however, roles and responsibilities for carrying out these chemical safety programs are not always clear, particularly within the line organizations.

Hanford contractors have implemented comprehensive programs of workplace hazard recognition, chemical exposure monitoring, and control systems involving engineering controls and personal protective equipment. Considerable effort has been devoted to developing systems to evaluate potential workplace exposures. Both PNL and WHC have developed and implemented hazard assessment programs to inventory workplace hazards, to evaluate the effectiveness of control measures, and to verify safety program implementation. PNL's Workplace Exposure Assessment (WEA) is fully implemented, and the WHC'S Comprehensive Baseline Hazard Assessment (CBHA) is under development.

With RL leadership and contractor participation, the Hanford Occupational Exposure Assessment Program (HOEAP) was developed and is being implemented to provide a uniform sitewide assessment system. Although application is not complete, HOEAP represents a commendable practice that groups similar activities and documents qualitative assessments. Results will be captured into a sitewide information management system that is currently under development for further analysis and quantitative exposure monitoring, as appropriate.

Workplace exposure monitoring is conducted by HEHF, as requested by contractor industrial hygiene personnel. HEHF maintains a data base of monitoring results. Real-time monitoring results taken by contractors are not tracked in the HEHF system, although WHC and PNL maintain their own separate record systems. Notification of contractor industrial hygiene personnel about the results of biological monitoring is incomplete. In addition, industrial hygiene data from the various site contractors are not routinely made available to HEHF medical staff.

Weaknesses were observed in the program and systems for performing various hazard analyses at Hanford. (See Vulnerability CSVR-RL-HAN-02.) Because of the heavy workload of industrial hygiene and industrial safety personnel, WHC does not always review job hazard analyses (JHAs) in a thorough and rigorous manner. The field verification team noted that improvements are needed in the graded approach used to differentiate low-hazard work plans and packages from those for high-hazard work. The differing hazard recognition and control systems implemented by multiple contractors at Hanford further contribute to an increased potential for personnel exposure to workplace hazards. This situation was exemplified by a recent near-miss event involving ICF KH and its subcontractor personnel.

The PNL Life Sciences Laboratory l,331 Building, is a large laboratory facility for chemical, biological, and environmental research. Many hazardous chemicals are present in the laboratory, usually in small amounts. The laboratory was designated as a nonnuclear, low-hazard facility. DOE 5481.1 B requires the preparation of safety analyses for all DOE facilities (other than those designated as excluded). Consistent with this order, PNL Manual PNL-MA-44, "Safety Analysis," requires a safety analysis document (i.e., a hazardous materials permit) for all PNL nonnuclear, low-hazard facilities. No hazardous materials permit exists for 331 Building, and there are no plans to prepare one.

The shift away from a position-based approach for qualification and certification toward a task-based training approach makes job hazards analysis more crucial to the training process. The loss of certified operators with extensive process and facility knowledge also forces greater reliance on job hazards analysis to ensure the safety of personnel, the facility, and the public.

RL has recognized the need for a more systematic approach to identify, analyze, control, and communicate hazards and to define more clearly the requirements for when safety, process, and hazard analyses are needed. As a first step, RL has issued a draft standard (RL-STD-01 -94, "Hazard Analysis and Communication") for comment by Hanford contractors. Implementation of this standard is expected to take place in about 6 months.

WHC has a lessons-learned program in place that has the basic elements of a sound system; however, a recent fatality at the Hanford Site demonstrated the need to communicate lessons-learned information more effectively. As part of its monitoring program, the DOE Office of Safety and Quality Assurance (EH-30) is working with WHC to enhance the current program and establish it as a model for the DOE complex.

Configuration management systems are in place at both PUREX and the Plutonium Finishing Plant. Both systems are currently being reviewed to determine how they can be modified to reflect cleanup and stabilization activities leading to either a surveillance and maintenance (S&M) or D&D configuration for these facilities.

The process of transitioning facilities from an operational status to S&M or D&D is lengthy. (At PUREX, this prolonged transition period has already exceeded 5 years.) The protracted period required for transitioning facilities is the result of many factors, including the following: (1) delays in the DOE decision-making process for mission changes, (2) the DOE decision to involve stakeholders in shutdown processes, and (3) multiple requirements by regulatory oversight organizations. These delays produce a complex set of impacts or uncertainties, including (1) loss of personnel to job transfers or retirement due to unchallenging work or the uncertainty created by the designation of an environmental restoration contractor, (2) a reduction in the reliability of process/process support equipment due to lack of use, (3) uncertainty about how "transuranic RCRA" chemical residue samples will be analyzed, and (4) the need for residues to be held in place until an approved stabilization process is implemented.

Numerous management systems and programs are in place at Hanford to control and eliminate chemical safety hazards. However, weaknesses in existing hazard analysis programs and the protracted time period required to transition facilities to a safe S&M mode or D&D status have increased the site's potential for chemical safety vulnerabilities.

2.4 Human Resource Programs

Verification activities associated with the human resources programs functional area at Hanford focused on training and qualifications, technical competence, employee involvement, staffing, employee concerns, and visitor and subcontractor access control. During the course of these activities, one potential chemical safety vulnerability was identified concerning the loss of corporate knowledge related to facilities and processes. (See Vulnerability CSVR-RL-HAN-03.)

Discussions related to human resource programs were conducted with management, training, and operations personnel representing WHC, PNL, and RL, and additional discussions were held with RL and Hanford Training Center personnel. WHC, PNL, and RL policy documents related to chemical safety programs were also reviewed. Procedures and documents were examined to review the strategy used to implement policies.

WHC and PNL promote a high level of worker awareness about issues related to chemical safety. Chemical hazard information is communicated to employees by a variety of means. A modem training facility is maintained in Richland, offering an extensive curriculum of safety and health courses. In addition to formal training, facility-specific briefings are provided for all personnel entering certain facilities. However, members of the field verification team noted that chemical hazards specific to the workplace were not discussed with employees at several WHC facilities. (See Vulnerability CSVR-RL-HAN-02.) WHC is in the process of approving training materials that will provide for discussions of facility-specific chemical hazards in the workplace.

With the exception of problems related to balancing the workload for industrial hygiene and industrial safety engineers (noted in Vulnerability CSVR-RL-HAN-02), staffing levels were found to be sufficient to ensure that personnel do not work excessive hours and that they have time to address chemical issues. A variety of safety and health professionals are available to support operating facilities. In general, sufficient resources are available to oversee routine and nonroutine chemical activities and to provide technical assistance on a timely basis.

Both WHC and PNL have implemented formal programs to address employee concerns. These programs are independent of the line organizations, and the employees consider them to be effective and useful. The PNL program provides status reports and appropriate input to the *Employee ES&H Exchange Monthly,* a newsletter published by the PNL Safety organization. The WHC program encourages employees raising issues to participate in the resolution of those issues. All issues brought to the program are recorded, analyzed, and tracked through resolution, and appropriate information is forwarded to the lessons-learned program. A review of employee concerns received by WHC and PNL during the period January 1993 through May 1994 identified no significant chemical safety issues. These programs are supplemented by the DOE Occupational Safety and Health (OS&H) Protection Program.

The prescription of training for an individual is the responsibility of that individual and of his or her immediate supervisor. Supervisors are responsible for ensuring that each individual receives the training required for his or her organization, facility, or program. Safety training requirements, the emphasis placed on the completion of training, and the accuracy and retention of records vary greatly between organizations at Hanford.

An extensive communication system is required to establish and maintain a cohesive and effective safety training function within the PNL matrix organization. Communications regarding work assignments, job locations, and necessary safety training appear to be effective, and most matrixed personnel are receiving appropriate safety training.

Access control to PNL facilities at Hanford is achieved through key cards or monitored building entry points. In addition to monitored building entry points, WHC uses a data base system, the Westinghouse Radiation Access Monitor, which queries radiological portions of the Training Records Information system through operators posted at facility access points. The next generation system, Access Control Entry System (ACES), which is currently being tested, will perform these queries automatically. Release 2, the next major revision of ACES, will permit automatic query for all training data related to building entry requirements. At the Chemical Engineering Laboratory, a system of controlled keys and locks is used to maintain access control. Responsibility for visitor access control has been transferred from Hanford Security to the manager of each facility. The transfer of highway security from Hanford Patrol to the Benton County Sheriff's Department, the release of sections of site access roads for public use, and the removal of some guard stations have raised the potential for unauthorized or accidental entry by the public into potentially hazardous areas.

RL links employee hazards awareness training and hazard waste operations training to entry requirements for specific facilities. Because entry requirements are established and maintained locally, there is confusion about which requirements apply, where those requirements are published, and the appropriate facility points-of-contact. If approved and implemented, RLID 5480.ACC, "Hanford Facility Access Requirements" (proposed), will establish basic entry requirements for all Hanford facilities and should resolve the problem. Considerable variation in the understanding of and adherence to chemical safety training requirements by RL personnel was noted.

The loss of corporate knowledge at the PUREX Plant and the Plutonium Finishing Plant may result in a chemical safety vulnerability whenever systems or components are operated, breached, or disassembled. This loss of corporate knowledge is a result of personnel turnover, intermittent configuration management throughout the life of the facilities, failure to capture and retain characterization data, and reductions in the scope of the training programs for these facilities.

2.5 **Emergency Management Program**

The emergency management program for chemical safety at Hanford is continuously evolving. Rooted in the radiological emergency management program, which has been in place for many years, the emergency management program includes three main components: emergency planning, emergency preparedness, and emergency response. The main driver for the emergency management program is the DOE 5500 series of Orders. For chemical emergencies, the DOE Orders are supplemented by regulations specified by the Occupational Safety and Health Administration (OSHA) in **29** CFR 1910.119 and 29 CFR 1910.120.

Hanford has established a series of interrelated emergency management documents that form an integrated set of emergency plans, including the Hanford Site Emergency Plan, a contingency plan, and fire plans for individual buildings. In addition, Hanford contractors have established facility-specific policies, plans, and procedures that are consistent with the overall emergency plan for the Hanford Site. Emergency implementing procedures have been developed describing the responsibilities, cautions, and activities of emergency responders. Plans address interface with Federal, State, Tribal, and local Governments, and memorandums of understanding are in place for assistance from other organizations (e.g., Kadlec Hospital) that may provide emergency response support or treatment for injured individuals. Chemical emergency plans at Hanford are developed for facilities in which hazards analyses indicate such plans are necessary.

HEHF assists Kadlec Hospital in treating chemically exposed accident victims. HEHF has developed a post-traumatic shock-treatment program to care for the emotional and psychological needs of accident victims, their co-workers, and family members. This program is considered a commendable practice.

Training for chemical emergencies is also an integrated program involving RL and all major contractor organizations at the site. All Hanford personnel (i.e., about 18,000 people) are provided with basic chemical awareness training consistent with DOE Orders and Federal regulations. Each facility is assigned a building manager or lead facility manager who is responsible for ensuring that all personnel at the facility are trained on their responsibilities during an emergency. Specialized training provided for emergency response teams ranges from the command and control duties at the Hanford Emergency Control Centers to detailed, hands-on emergency responder training for hazardous materials (HAZMAT) teams. HAZMAT training conforms to the standards of the National Fire Protection Association, and periodic drills and exercises are conducted to evaluate and maintain a state of readiness to respond to chemical accidents.

A new Hazardous Material Management and Emergency Response Training Program, referred to as HAMMER, has been established at Hanford. This program will provide hands-on, performance-based training in all aspects of hazardous material safety. While the new 82-acre training center is being constructed, the program is offering a limited number of courses. The HAMMER program is a new, first-of-a-kind concept that shows exceptional promise and is considered a commendable practice. In addition to training Hanford HAZMAT emergency personnel, HAMMER will serve as a national resource to support the HAZMAT needs of organized labor; State, Tribal, and local Governments; and other Federal agencies.

Emergency supplies and equipment are described in site- and facility-specific emergency plans and procedures, including those for dedicated facilities such as the Hanford Emergency Operations Plant, multiple-use facilities such as the emergency operations room at the Plutonium Finishing Plant, and mobile vehicles such as the HAZMAT van owned by the Hanford Fire Department. Emergency equipment and supplies maintained by Hanford contractors include communications equipment, chemical treatment and containment kits, personnel protective equipment, facility material inventories, maps, and chemical exposure dose assessment computer programs. All emergency-related equipment and supplies are included in contractor-administered inventory and maintenance programs.

Until about 4 years ago, the focus of emergency management activities was on potential radiological accidents. As facilities shut down and missions shift toward D&D, there has been an increased awareness of the need to pay more attention to potential chemical accidents. This awareness has been heightened by the development of comprehensive worker right-to-know programs required by OSHA.

Most Hanford personnel interviewed during this review were generally aware that a fundamental shift in mindset is required to prepare fully for chemical emergencies—a shift from focusing on low-probability, high-consequence radiological accidents toward emphasis on higher probability, lower consequence accidents. Site personnel have been actively reviewing the Hanford Emergency Management Program in this light, and numerous efforts have been under way to change the program accordingly, including an expansion of the section addressing chemicals in the 5-year planning document titled “Emergency Readiness Assurance Plan.”

A process to monitor changes at a facility is important for maintaining reliable chemical emergency plans and is required by 29 CFR 1910.120. PNL’s chemical inventory data base is programmed to notify the PNL Emergency Coordinator when chemical inventories reach 90 percent of the permissible threshold quantity. Facility conditions can then be closely monitored for potential impacts on emergency plans. This approach is considered a commendable practice.

In summary, Hanford personnel have identified a number of improvements in the area of chemical emergency management that should enhance the maturity of the site’s overall emergency management program. However, all personnel expressed confidence (1) that a firm foundation for such a program is already in place and (2) that a chemical emergency management program consistent with the hazards associated with Hanford’s transition to D&D will continue to evolve.

3.0 CATEGORIZATION AND PRIORITIZATION OF VULNERABILITIES

3.1 Criteria

A vulnerability is defined as a weakness or potential weakness involving hazardous chemicals that could result in a threat to the environment, the public, or worker safety and health. Vulnerabilities can be characterized by physical or programmatic conditions associated with uncertainties, acknowledged deficiencies, and/or unacknowledged deficiencies in the area of chemical safety. Conditions required to create the vulnerability should either currently exist or be reasonably expected to exist in the future, based on degradation of systems and chemicals or through expected actions (i.e., **D&D** of facility),

A vulnerability will be determined to exist if current or expected future conditions or weaknesses could result in either of the following:

- The death of or serious physical harm[2] to a worker or a member of the public or the continuous exposure of a worker or member of the public to levels of hazardous chemicals above hazardous limits; or

- Environmental impacts resulting from the release of hazardous chemicals above established limits.

The prioritization of the chemical safety vulnerabilities is based on the professional judgment of team members concerning the immediacy of the potential consequences posed by each vulnerability and on the potential severity of those consequences. The first step in the prioritization process is to group vulnerabilities according to the timeframe in which they are expected to produce consequences. The following categories have been established for the timeframe within which consequences are expected to occur:

- <u>Immediate</u> — Any chemical safety vulnerability that could result in immediate consequences.

- <u>Short-Term</u> — Any chemical safety vulnerability at a facility in which there is a significant chance of a consequence occurring within a 3-year timeframe as a result of chemical degradation, change in mission for the facility, degradation of the containment systems, change in personnel at the facility, or other factors affecting the facility.

- <u>Medium-Term</u> — Any chemical safety vulnerability at a facility in which there is a significant chance of a consequence occurring within a 3–1 O year timeframe as a result of chemical degradation, change in mission for the facility, degradation of the containment systems, change in personnel at the facility, or other factors affecting the facility.

- <u>Long-Terrn</u> — Any chemical safety vulnerability at a facility in which there is a significant chance of a consequence occurring within a timeframe of more than 10 years as a result

---

[2] Serious physical harm is defined as impairment of the body, leaving part of the body functionally **useless or substantially reducing efficiency on or off the job.**

of chemical degradation, change in mission for the facility, degradation of the containment systems, change in personnel at the facility, or other factors affecting the facility.

Vulnerabilities within each category should be further prioritized to specify “high,” “medium,” or “low” priority based on the severity of the potential consequences. Examples of the second level of prioritization include the following:

- “ Prioritize potential harm to workers or the public according to the possible level of injury and/or health effects, ranging from transient reversible illness or injury to death.

- Prioritize environmental impacts based **on the level of irreversible damage and/or restoration costs.**

3.2 Chemical Safety Vulnerabilities at the Hanford Site

The chemical safety vulnerabilities summarized in this section were derived from specific observations made during the field verification process. Three vulnerabilities were identified at Hanford. They are prioritized in accordance with guidance provided in Section 3.1, which was derived from Attachment 7 of the “Project Plan for the Chemical Safety Vulnerability Review,” dated March 14, 1994. (Completed vulnerability forms are provided in Attachment 2 of this appendix.)

CSVR-RL-HAN-O1: Large quantities of surplus hazardous chemicals are being stored for prolonged periods in production facilities that are being transitioned to deactivated status.

Large quantities of nitric acid, aluminum nitrate, carbon tetrachloride, and tributylphosphate solvent are being stored at the PUREX Plant and at the Plutonium Finishing Plant in outside tanks or drums. Prolonged storage of hazardous chemicals in shutdown or deactivated facilities may lead to personnel hazards or environmental releases caused by spills, evaporation, leakage from corroded tanks or drums, decomposition of chemicals, or lack of adequate administrative controls. These conditions and circumstances represent a low-priority **vulnerability with a potential for short- to medium-term consequences.**

CSVR-RL-HAN-02: Weaknesses exist in some aspects of the hazard analysis program at Hanford.

Weaknesses exist in some aspects of the program and systems for performing various hazard analyses at the Hanford Site. The field verification team noted that the graded approach used to differentiate low-hazard work plans and packages from high-hazard plans and packages needs improvement. Differing hazard recognition and control systems implemented by multiple contractors, along with inconsistently performed facility hazard analyses, further contribute to an increased potential for personnel exposure to workplace hazards. These conditions and circumstances represent a medium-priority vulnerability with a potential for immediate consequences.

CSVR-RL-HAN-03: A loss of corporate knowledge may adversely affect cleanup activities at the Hanford Site.

The loss of corporate knowledge may result in chemical safety vulnerabilities, particularly when systems or components are operated, breached, or disassembled. The loss of corporate knowledge is a result of personnel turnover, inconsistent configuration management, failure to capture and retain characterization data, and reductions in the scope of the training program. These conditions and circumstances increase the possibility for accidents or releases involving hazardous chemicals and represent a low- to medium-priority vulnerability with a potential for immediate to short-term consequences. By the nature of this vulnerability, the severity of the consequences can be expected to increase with time.

Attachment 1

TEAM COMPOSITION

Area of Responsibility	Name/Organization
Team Leader	Bal M. Mahajan Office of Safety and Quality Assurance U.S. Department of Energy
Management/Operations	Bernard R. Kokenge BRK Associates, Inc.
Management/Training	Thomas L. Van Witbeck TOMA Enterprises
Chemical Process Safety	Harold J. Groh HJG, Inc.
Industrial Hygiene	James L. Woodring Argonne National Laboratory
Environmental Protection	Richard R, Lunt Arthur D. Little, Inc.
Maintenance	David M. Johnson Program Management, Inc.
Emergency Management	W. Earl Carries Office of Nuclear Safety U.S. Department of Energy
Site Liaisons	Doug S, Shoop Westinghouse Hanford Company
	David T. Evans Richland Operations Office U.S. Department of Energy
EH Site Representative	Robed C. Cullison Office of Safety and Quality Assurance U.S. Department of Energy
Coordinators	Nancy L. Sanderson EG&G Rocky Flats, Inc.
	Julie A. Sellars EG&G Idaho, Inc.
Technical Editor	Darla Treat Courtney Environmental Management Associates

ATTACHMENT 2

CHEMICAL SAFETY VULNERABILITY REVIEW
VULNERABILITY FORM **DATE: May 7, 1994**

'Site~Facility: **Hanford/PUREX and Plutonium Finishing Plant**

Vulnerability Number: CSVR-RL-HAN-01

Functional Area(s): **Identification of Chemical Holdings, Operational Control and Management .Systems**

1. **Brief Description of Vulnerability.**

   Large quantities of surplus hazardous chemicals are being stored for prolonged periods in production facilities that are being transitioned to deactivated status.

2. **Summary of Vulnerability.**

   Prolonged storage of hazardous chemicals in shutdown or deactivated facilities may lead to personnel hazards or environmental releases caused by spills, evaporation, leakage from corroded tanks or drums, decomposition of chemicals, or lack of adequate administrative controls.

3: **Basis.**

a. Requirements:

- **WHC Operating Procedure PO-020-290 describes spill response and cleanup of hazardous materials.**
- **WHC Operating Procedure PO-040-305 describes routine surveillance requirements for storage tanks.**
- **WHC-CM-5-8, 3.12, "Carcinogen Control Program," describes the carcinogen control program for the Plutonium Finishing Plant (PFP).**
- **WHC-CM-5-8, 7.1, "Hazardous Material Management Plan," describes management requirements for storage areas, labeling, compatibility, training, and emergency response.**
- **WHC-CM-7-5, "Environmental Compliance," describes requirements for hazardous materials storage tanks, such as labeling and spill plans.**
- **29 CFR 1910.1200, "Hazard Communication Standards," specifies requirements for training, communications, and material safety data sheets.**

b. Chemicals Involved:

- **Forty-eight 55-gallon drums (2,640 gallons total) containing unused carbon tetrachloride are stored outside PFP.**
- **About 3,000 gallons of 12M nitric acid are stored in one stainless steel tank located outside PFP.**
- **About 8,000 gallons of 3M aluminum nitrate solution are stored in 2 stainless-steel tanks at PFP (one tank inside the facility, one tank outside).**
- **About 190,000 gallons of nitric acid, ranging from 7M to 11 M, were recovered at the UO_3 Plant, returned to the PUREX Plant, and stored in seven stainless-steel tanks (five tanks outside the plant and two inside).**
- **About 21,000 gallons of slightly contaminated tributylphosphate (23 percent) in normal paraffin hydrocarbon solvent were recovered from the PUREX Plant and are stored in one stainless-steel tank outside the plant.**

Site/Facility: Hanford/PUREX and Plutonium Finishing Plant

Vulnerability Number: CSVR-RL-HAN-O1

Functional Area(s): Identification of Chemical Holdings, Operational Control and Management Systems

4. Supporting Observations. (Continued)

- The carbon tetrachloride (CCI,) stored outside the PFP was purchased for use in the plant process but may no longer be needed because of the conversion of the plant to inactive status. CCl_4 is a suspected human carcinogen and is stored in 48 55-gallon plastic-lined, carbon steel drums, which are approved for this use. The drums are stored outdoors on poly-spill pallets beneath a tent for protection from the weather. Several drums have leaked in the past because of corrosion, resulting in release of CCl_4 to the environment and worker exposure. (No injuries occurred). The drums that leaked were stored without protection from the weather and without leak-containment pallets. The only routine leak detection of these drums is performed by visual inspection. Because of the placement on the pallets, the interior drums cannot be inspected. The area is posted to warn workers of the hazard, and the drums are properly labeled. Preparations are being made to sell the CCl_4 to a vendor, but this option is being reviewed because of the need to prepare an EIS to examine the future use of the PFP. There is some concern that sale of the CCl_4 might be perceived to limit EIS options because CCl_4 is the solvent used for a plutonium recovery process. WHC is evaluating whether these drums should be moved to indoor storage in the event that storage over an extended period of time is required.

  The nitric acid and aluminum nitrate solutions stored at PFP are not radioactively contaminated, and quantities not used for the cleanout of the plant will probably be sold to vendors. The stainless-steel tanks containing the nitric acid and aluminum nitrate solutions are about 40 years old and are not routinely inspected by nondestructive examination (NDE) methods for deterioration of wall thickness. (NDE was conducted on the tank walls in 1987; no inadequacies were identified.) The tanks are installed in diked areas for spill containment.

- The PUREX Plant was originally shut down in December 1988 because of an operational safety requirement (OSR) violation. Subsequent to the OSR violation, WHC management instituted corrective actions in response to DOE restart requirements. These actions were completed in March 1990, at which time the PUREX Plant began transition to a standby status. PUREX remained in transition to standby status under DOE direction until December 1992, at which time an order for permanent shutdown was issued. In October 1993, DOE made the decision to deactivate the PUREX Plant, and deactivation activities are now under way. More than 5 years have elapsed since the original shutdown, Since 1991, considerable progress has been made in removing excess chemicals. In 1991 alone, about 2 million pounds of process chemicals were removed from the plant.

 DATE: May 7, 1994

Site/Facility: Hanford/PUREX and Plutonium Finishing Plant

Vulnerability Number: CSVR-RL-HAN-01

Functional Area(s): Identification of Chemical Holdings, Operational Control and Management Systems

4. Supporting Observations. (Continued)

Although an overall project plan has been proposed for the deactivation of the plant, and even though deactivation is under way, specific endpoint criteria are not expected to be in place until the end of 1994. The removal of all chemical residues from the PUREX Plant is not expected until the end of 1996.

– A total of 190,000 gallons of nitric acid was recovered from the $U0_3$ Plant and transferred to the PUREX Plant. The nitric acid is slightly contaminated with radioactivity; therefore, it cannot be sold for uncontrolled use. The current plan is to transfer the material to the British Government for use in its reprocessing plants. This plan may be pursued in the near term.

– A total of 21,000 gallons of tributylphosphate (TBP) solvent was recovered from the PUREX process. The TBP is slightly contaminated with radioactivity. A plan to ship this material to the INEL chemical processing plant, where it would be burned in the waste calciner, has been stopped for regulatory reasons, Idaho will not accept the waste because it is a regulated as a dangerous waste in Washington State (although it is not a regulated waste in Idaho). The material cannot be shipped to the new incinerator under construction at SRS because South Carolina has permitted the facility only for SRS-generated wastes. Other options are being examined, including commercial incinerators and a purchased steam reformer that would destrov the solvent. These options are currently being assessed in an engineering study. The solvent will probably be stored for several years before the issue can be resolved. There is some risk of leakage from the tank, which creates the potential for worker exposure and a small risk of solvent fires. The tank is in a diked area, is monitored, and has fire protection.

CHEMICAL SAFETY VULNERABILITY REVIEW
VULNERABILITY FORM

DATE: May 7,1994

Site/Facility: Hanford

Vulnerability Number: CSVR-RL-HAN-02

Functional Area(s): Operational Control and Management Systems

1. Brief Description of Vulnerability.

Weaknesses exist in some aspects of the hazard analysis program at Hanford.

2. Summary of Vulnerability.

Weaknesses exist in the program and systems for performing various chemical hazard analyses at the Hanford Site. Because of the workload of industrial hygiene and safety personnel, job hazard analyses (JHAs) are not alwavs reviewed by WHC in a thorough and rigorous manner. The different hazard recognition and control systems implemented by the ‘multiple contractors, along with inconsistently performed facility hazard analyses, further contribute to an increased potential for personnel exposure to workplace hazards.

3. Basis.

a. Requirements:

- DOE 5480.10, paragraph 9, requires that the contractor (1) identify and evaluate chemical hazards in the workplace and (2) implement control measures to prevent or minimize exposure to these hazards.
- WHC-CM-4-3, “Pre-Job Safety Planning/Job Hazard Analysis,” dated April 30, 1993, provides the basis for performing a JHA.
- DOE 5481.1 B requires the preparation of safety analyses for all DOE facilities, except for those designated as “excluded.”
- PNL-MA-44, “Safety Analysis,” requires a safety analysis document (i.e., a “Hazard Management Plan,” or HMP) for all PNL nonnuclear, low-hazard facilities.

b. Chemicals Involved:

- This vulnerability relates to hazard analysis in general and, thus, to all chemicals posing a hazard in the workplace.
- The example cited at the WHC Chemical Engineering Laboratory (CEL) involved the following chemicals:

Chemical	Form	Quantity [Kg)
Tributylphosphate	liquid	28.7
Normal Paraffin Hydrocarbons	liquid	12,3

c. Relevant Self-Evaluation Data: The JHA program was not perceived as a potential vulnerability.

 DATE: May 7, 1994

Site/Facility: Hanford

Vulnerability Number: CSVR-RL-HAN-02

Functional Area(s): Operational Control and Management Systems

3. Basis. (Continued)

d. Contributing Causes: Programs for conducting chemical hazard analysis have not been properly or consistently implemented.

e. Potential Consequences: There is an increased potential for personnel exposures to workplace hazards when hazard analyses are not rigorously performed. These conditions and circumstances represent a medium-priority vulnerability with a potential for immediate consequences.

4. Supporting Observations.

- The application of rigorous job hazard analysis has become increasingly crucial at the Hanford Site. The shift from a position-based qualification and/or certification approach to a task-based training approach makes the job hazard analysis even more crucial to the training process. The loss of certified operators having extensive process and facility knowledge also forces greater reliance on JHAs to ensure the protection of workers, facilities, and the public.

- Training associated with the PUREX Facility Building Emergency Plan and Hazards Checklist (Course No, 03 E024) provides instructions on the use of a material safety data sheet, but it does not require that specific chemical hazards be discussed. Certification for PUREX deactivation operators does not address the chemical hazards of the waste streams transferred by the operators.

- The Plutonium Finishing Plant (PFP) Hazards Communication Program does not address specific chemical hazards in the workplace, although a revised program that addresses this matter is in the process of being approved. The field verification team noted that pre-job briefings conducted at PUREX and PFP address job-specific chemical hazards.

- A review of approved JHA work plans for the CEL indicated that these plans do not always receive a thorough and indepth review by industrial hygiene and/or industrial safety personnel when required. In many cases, sign-offs are obtained to take care of “paperwork” without conducting an indepth review of the proposed work.

- Discussions with CEL management indicated that industrial hygienists visit the CEL workplace on an infrequent basis, even though hazardous chemicals are routinely handled in the facility.

- Discussions with WHC industrial safety and/or industrial hygiene personnel indicated that they may review as many as 30 work plans or work packages per day. The workload does not permit sufficient time for thorough review, The situation is further exacerbated by a review system that permits low-hazard work packages to receive the same level of review as that for higher hazards,

- Technical safety support personnel at PUREX Plant are developing a JHA process for their work plans because, in their opinion, the current WHC JHA system does not provide a thorough or rigorous review of work plans.

'Site/Facility: Hanford

Vulnerability Number: CSVR-RL-HAN-02

Functional Area(s): Operational Control and Management Systems

4. Supporting Observations. (Continued)

- The WHC Safety Department has just completed a reorganization to resolve recognized weaknesses in the JHA review process, The intent of these organizational changes is to align resources on a project basis and to locate Safety Department personnel physically closer to the areas they support. Because WHC Safety Department management recognizes that these changes will not completely resolve weaknesses associated with the JHA process, additional corrective actions are currently being evaluated.

- Hanford Site is operated by multiple contractors, each with its own work control system. Thus, contractor hazard recognition and control systems may differ. Nonuniform application of work control requirements to protect the work force can lead to confusion, procedural noncompliance, or injury and is an issue at the Hanford Site, A near-miss event still under investigation supports this point. The event occurred on April 20, 1994, when ICF Kaiser Hanford Company personnel, relying on information from a subcontractor, were in the process of removing a blank on a 25-psi steam line without having the required double-valve isolation in place upstream. The work had not been approved by 222-S management.

- The PNL Life Sciences Laboratory 1, Building, is a large laboratory facility for chemical, biological, and environmental research. Many hazardous chemicals are present in the laboratory, usually in small amounts. The laboratory was designated as a nonnuclear, low-hazard facility. DOE 5481.1 B requires the preparation of safety analyses for all DOE facilities (other than those designated as excluded). Consistent with this Order, PNL Manual PNL-MA-44, "Safety Analysis," requires a safety analysis document (i.e., an HMP) for all PNL nonnuclear, low-hazard facilities. No HMP exists for the 331 Building, and there are no plans to prepare one. RL and PNL management both explained that higher priority is being given to safety analysis activities for nuclear facilities and that numerous other analyses-such as JHAs, workplace exposure assessments, test plans, engineering analyses, and fire safety reviews-give adequate assurance of safety for the laboratory and for protection of workers.

- Lack of DOE guidance for conducting rigorous safety analyses of chemical process hazards was acknowledged to be an ongoing problem by RL and contractor management. It was noted that guidance may be forthcoming in two proposed DOE technical standards, "Analysis of Chemical Process Hazards" and "Process Safety Management for Highly Hazardous Chemicals." RL has recognized the need for a more systematic approach to identify, analyze, control, and communicate hazards and to define more clearly the requirements for when safety, process, and hazard analyses are needed. As a first step, RL has issued a draft standard, (RL-STD-01 -94, "Hazard Analysis and Communication") for comment by Hanford contractors. Implementation of this standard is expected to take place in about 6 months.

CHEMICAL SAFETY VULNERABILITY REVIEW
VULNERABILITY FORM

DATE: May 7, 1994

Site/Facility: Hanford/PUREX and Plutonium Finishing Plant

Vulnerability Number: CSVR-RL-HAN-03

Functional Area(s): Operational Control and Management Systems, Human Resource Programs

1. Brief Description of Vulnerability.

A loss of corporate knowledge may adversely affect cleanup activities at the Hanford Site.

2. Summary of Vulnerability.

The loss of corporate knowledge may result in chemical safety vulnerabilities, particularly when systems or components are operated, breached, or disassembled, The loss of corporate knowledge is a result of personnel turnover, inconsistent configuration management, failure to capture and retain characterization data, and reductions in the scope of the training program.

3. Basis.

a. Requirements: The safety and health of workers and the public must be preserved for all activities conducted for or by the Department. The requirements of DOE Orders affect the loss of corporate knowledge by regulating the activities that have contributed to such losses. In general, the requirements of the Orders are addressed by the management systems that currently exist at Hanford; however, many of the deficiencies related to the loss of corporate knowledge predate the Orders.

The following Orders apply to the Supporting Observations (Section 4 of this form): DOE 1324.2A, “Records Disposition for DOE Facilities,” dated July 9, 1990; DOE 5480.20, “Personnel Selection, Qualification, Training, and Staffing Requirements at DOE Reactor and Non-Reactor Nuclear Facilities,” July 20, 1991; DOE 6430.1 A, “General Design Criteria,” April 6, 1989; 29 CFR 1910.120, “Hazardous Waste Operations and Emergency Response;” and 25 CFR 1910.1200, “Hazard Communication Standards.”

b. Chemicals Involved:

- Plutonium and plutonium compounds
- Uranium and uranium compounds
- About 176 pounds of sodium hydroxide
- Forty-eight 55-gallon drums (2,640 gallons total) containing unused carbon tetrachloride are stored outside the Plutonium Finishing Plant (PFP).
- About 3,000 gallons of 12M nitric acid are stored in one stainless-steel tank outside the Plutonium Finishing Plant.
- About 8,000 gallons of 3M aluminum nitrate solution are stored in two stainless-steel tanks at PFP (one tank inside the facility, one tank outside).
- About 190,000 gallons of nitric acid, ranging from about 7M to 11 M, were recovered at the UO3 Plant, returned to the PUREX Plant, and are stored in seven stainless-steel tanks (five tanks outside the plant and two inside).

Site/Facility: Hanford/PUREX and Plutonium Finishing Plant

Vulnerability Number: CSVR-RL-HAN-03

Functional Area(s): Operational Control and Management Systems, Human Resource Programs

3, Basis. (Continued)

. About 21,000 gallons of slightly contaminated tributylphosphate (23 percent) in normal paraffin hydrocarbon solvent were recovered from the PUREX Plant and are stored in one stainless-steel tank outside the plant.

c. Relevant Self-Evaluation Data: Issue not addressed.

d. Contributing Causes:

- PUREX Plant is an old facility that has had an incomplete configuration management program for much of its lifetime; therefore, complete and accurate records of all systems and processes are not available.
- Many certified operators and managers knowledgeable about the operation of the PUREX Plant and the PFP have transferred to other facilities or have left the Hanford Site.
- WHC management is aware of the continual loss of experienced personnel at the PUREX Plant. However, there is no plan in place to minimize these losses.
- The protracted decision-making process for determining the ultimate disposition of Hanford facilities has created an atmosphere of uncertainty about the future, which in turn has resulted in the loss of experienced personnel.

e. Potential Consequences: The increased potential for accidents or releases involving hazardous chemicals caused by these conditions represents a low- to medium-priority vulnerability with a potential for immediate to short-term consequences. By the nature of this vulnerability, the severity of the consequences can be expected to increase with time.

4. Supporting Observations.

- As a result of the protracted shutdown of both PFP and PUREX, many operators assigned to these facilities have limited knowledge and experience in the operation of process equipment and systems. The PUREX Plant has been shut down since December 1988. Since that time, particularly over the past 3 years, there has been a steady decline in overall staffing levels at PUREX Plant. For example, about 122 nuclear and/or power operators were involved in operations 3 years ago; today, only 55 are involved.

- The decision-making process concerning facility disposition has become protracted because of a number of factors, as discussed in the supporting observations cited in Vulnerability CSVR-RL-HAN-O1. The protracted decision-making process has contributed to uncertainty about future job opportunities. Fearing the loss of jobs or the lack of professionally rewarding opportunities, many experienced personnel are leaving their current positions to pursue other opportunities. For example, during the course of the Chemical Safety Vulnerability Review, an engineer with 14 years of PUREX experience left the facility for a position in high-level waste technology.

Site/Facility: Hanford/PUREX and Plutonium Finishing Plant

Vulnerability Number: CSVR-RL-HAN-03

Functional Area(s): Operational Control and Management Systems, Human Resource Programs

4. Supporting Observations. (Continued)

- Bechtel's designation as the Environmental Restoration Contractor (ERC) has increased the level of uncertainty for many Hanford personnel.

- PUREX currently has five classifications for which certification is compensated: Dispatcher, Solid Waste Handler, Deactivation Operations, N Cell, and Surveillance (OSR). Compensation is per certification and is cumulative up to six certifications. As the need for personnel in each classification is reduced, or the number of classifications is reduced, senior personnel with extensive knowledge of the facility may transfer to facilities with more positions per classification or more classifications.

- Training at PUREX is shifting from a position-based qualification and/or certification approach to a discrete task-based approach. In a task-based approach, training is limited to that which is necessary to perform the work associated with a given task. Courses addressing a facility and/or processes that are characteristic of a position-based training program will be eliminated. As a result, new staff members will have less knowledge of the facility.

- As process and technical training requirements are reduced, the need for instructors having extensive knowledge in these areas will also be reduced.

- The move to a deactivated status has resulted in scheduled budget reductions for training, which in turn will force reductions both in staff and in the scope of the training program.

Attachment 3

SELECTED ACRONYMS

CFR	Code of Federal Regulations
D&D	Decontamination and Decommissioning
DOE	U.S. Department of Energy
EIS	Environmental Impact Statement
EH	DOE Office of Environment, Safety and Health
HEHF	Hanford Environmental Health Foundation
ICF KH	ICF Kaiser Hanford Company
OSHA	Occupational Safety and Health Administration
PNL	Pacific Northwest Laboratory
RCRA	Resource Conservation and Recovery Act
RL	Richland Operations Office
SARA	Superfund Amendments and Reauthorization Act
WHC	Westinghouse Hanford Company